
Prescott

THE

# INVERTED SCHEME

OF

# COPERNICUS;

WITH THE PRETENDED EXPERIMENTS

UPON WHICH HIS FOLLOWERS HAVE FOUNDED THEIR

## HYPOTHESES OF MATTER AND MOTION,

COMPARED WITH FACTS,

AND WITH THE

EXPERIENCE OF THE SENSES:

AND THE DOCTRINE OF

## THE FORMATION OF WORLDS OUT OF ATOMS,

BY THE POWER OF

## GRAVITY AND ATTRACTION,

CONTRASTED WITH THE FORMATION OF

## ONE WORLD BY DIVINE POWER,

AS IT IS REVEALED IN

# THE HISTORY OF THE CREATION.

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BOOK THE FIRST.

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TO WHICH IS PREFIXED

A LETTER

TO

SIR HUMPHREY DAVY, BART.

PRESIDENT OF THE ROYAL SOCIETY.

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BY B. PRESCOT.

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"Though in pure mathematics he that can demonstrate well may be sure of the truth of a conclusion, without consulting experience about it; yet because demonstrations are wont to be built upon SUPPOSITIONS or POSTULATES; and some things, though not in arithmetic or geometry, yet in physical matters, are WONT TO BE TAKEN FOR GRANTED, about which men are liable to slip into mistakes; even when we doubt not of the ratiocination we may doubt of the conclusion, because we may of the truth of some of the things it supposes; and this consideration, if there be no other, will I hope excuse me to mathematicians for venturing to confute some reasonings that are given out for mathematical demonstrations. For I suppose it will be considered, that those whose presumed demonstrations I examine, though they were some of them professors of mathematics, yet, did not write merely as mathematicians, but partly as naturalists; so that to question their tenets ought not to disparage those as well certain as excellent and most useful sciences pure mathematics, any more than that the mathematicians that follow the Ptolemaic, the Copernican, the Tychonian, or other systems of the world, write books to manifest one-another's paralogisms in astronomical matters; and therefore it cannot but be a satisfaction to a wary man to CONSULT SENSE about these things that fall under the cognizance of it, AND TO EXAMINE BY EXPERIENCE WHETHER MEN HAVE NOT BEEN MISTAKEN IN THEIR HYPOTHESES AND REASONINGS."

*Hon. Rob. Boyle's Works, 2nd Vol. page 742. Ed. 1772.*

TO

## SIR HUMPHREY DAVY, BART.

PRESIDENT

OF THE

## ROYAL SOCIETY.

SIR,

CONSIDERING the honorable situation you at present occupy, as president of one of the most learned societies in the world, I naturally suppose you must feel a lively interest in whatever tends to the advancement of science in general; but more particularly of those branches, for the improvement of which, the Royal Society was first instituted.

The charters granted by King Charles the Second, and confirmed by his royal successors, I observe expressly state, that the society "was ordained, constituted and appointed, *for the improvement of natural knowledge;*" and every person, on becoming a member, subscribes an obligation, binding himself to promote its advancement and prosperity. That it has, in an eminent degree, fulfilled the professed intention of its first institution, will readily be admitted by all

who have looked into the records of its transactions: and when it is considered, that those ample volumes contain the results of the united labours of its numerous members; men of accomplished abilities, and diligent students in every department of natural philosophy; that they have, in succession, zealously cultivated each one his favourite subject, during one hundred and sixty years; it may, at this late period of time, seem almost presumptuous in any one to announce, that he has something new and useful to submit to the consideration of a society so deservedly celebrated in the annals of human improvement:—more particularly when it is further considered, how very few subjects, at the time when it commenced its labours, remained to be examined, that had not previously been investigated and illustrated by the venerated sages of former times.

However, Sir, it appears to me, that *much* still remains to be done; and, may I presume to add, *more*, perhaps, remains to be *undone*. It is only necessary to take a cursory view of the garden of the sciences, to satisfy ourselves, that the plants which are really nutritive, and the flowers that yield a reviving fragrance, bear but a small proportion to the useless and noxious weeds that every where poison the springs of health, offend the senses,

encumber the ground, and obstruct us in our mental walks: while the husbandmen have slept, enemies have cast in tares, and the world is now reaping the bitter harvest. Since men, from mercenary and other unworthy motives, became authors by profession: since they began to prostitute the immortal talent committed to them, by catering for the public taste, to gratify the sickly and ever-craving appetite for novelty;—these tares have multiplied beyond all measure;—and the sowers of the pernicious seeds have been rapidly advanced to affluence, raised to flattering distinctions, and to temporary fame. By what neglect, or by what means, the garden has thus been brought into a state of disorder —overshadowed with unprofitable weeds,— I shall not further enquire. That it is so, every attentive observer, who possesses a reflecting mind, may easily perceive: and I think it is equally obvious that many nations are now feeling the calamitous consequences of it. Seeing that WISDOM has declared, that "the multitude of the wise is the welfare of the world;" and in another place, while contemplating prospectively the blessings of a future age, the same DIVINE SOURCE has promised, that "WISDOM and KNOWLEDGE shall be the STABILITY of it;"—it clearly follows, from the daily symptoms of INSTABILITY in religion,

philosophy, laws and politics, which is universally manifested in all civilized nations, that real beneficial knowledge is either ill administered, or but little attended to: or, that its advancement is impeded by a variety of erroneous principles plausibly imposed upon the world by GREAT NAMES, and thoughtlessly adopted by those to whose care is committed the education of the superior ranks of society.

But, to come more immediately to the subject of my letter;—it is to ONE GREAT ERROR in public education that I particularly wish to call your attention; and I consider *this*, in its tendency, of greater importance than all the rest put together. This error, which has been considered the glory of our nation, holds a conspicuous place in the course prescribed to the students at all our universities and public schools;—THE MODERN SYSTEM OF PHYSICS; or, in more precise terms,—the modern system of astronomy—the Solar System; which combines the Copernican, Keplerian and Newtonian hypotheses. I do not hesitate to say, that, to hold a firm belief in this system, and, at the same time, in the sacred records, is an incongruity that cannot rationally exist in any intelligent and reflecting mind. This is a proposition, the substance of which, among other things, I have main-

tained in the book of which I have now the honor to request your acceptance, and to recommend to your attentive perusal.

Until about the period of, what has been termed, the revival of learning and the discovery of the art of printing; the first chapters of Genesis, among Jews and Christians, were generally believed to contain faithful accounts of the creation of animate and inanimate things; and, likewise, of the orderly disposition of them, as they appear to us at this day in the great constitution of the universe. Why this venerable and well authenticated account, was so directly opposed, about that particular period, by the revival of the fable of Pythagoras, the magician, is a circumstance which, at this time, is of no great importance to be discussed. One thing, however, is very certain, that the art of printing caused the Bible to be, comparatively, easy of access; and the spread of learning enabled greater numbers of people to examine its contents than at any preceding period of time. It is equally certain, that those writers who first attacked it in its very foundation, by the revival of the greek fable, were not friendly to the circulation of the Holy Scriptures. Why they should have been hostile to its beneficial light and influence, I cannot tell; unless it were that its precepts are favourable to peace and rational

liberty, and that its light exposes to condemnation every thing that is false in principle and unjust in practice. The first, it seems, who attacked it in that way, was Cardinal Nicholas de Cusa; a man who was addicted to mathematics and philosophy. Copernicus, a canon of Worms, soon succeeded him in the work, and laboured with considerable success in giving a degree of plausibility to the scheme. He was followed in the same course by John Kepler, astrologer to the Emperor Rodolf, who appears to have been an apt student in the Pythagorean tenets; teaching that "all the stars are animated; and that as all animals move by means of their muscles, the earth and planets have also muscles proportioned to their bulk, which are the instruments they move with. The sun has a very noble and active *soul:* his rays put in action the *souls* of the planets." Again, "the *faculty* of the sublunary world *perceives* and is *terrified* at the comet; and together with it, the *faculties* of all sublunary things.—The *faculty* of the earth being *terrified* at the unusual appearance of the *comet*, in one part of the earth, sweats out a great quantity of vapour, according to the quality of that part of its body; hence proceed great rains and floods." Further, that the earth was "a vast animal, breathing out winds through holes in the mountains,

as it were through a mouth and nostrils." He promulgated many other fictions and astrological notions; for which "absurdities," as they termed them, he was severely censured by Bulialdus and Schookius, by way of apology, perhaps, for their adoption of some others of his curious notions, which I have elsewhere noticed and treated of. Galileo, a Florentine gentleman, co-operated with Kepler in the same cause; but as he could not approve of Kepler's laws of *muscular* motion in the planetary bodies; he propounded other laws of motion, by which nature never worked. Descartes and Newton afterwards conceived other mediums, powers and laws of motion, and supported them by symbols, diagrams and very elaborate mathematical ratios. The system these learned men had adopted, being contrary to the scriptures and to the human senses, they found it extremely difficult to set and keep their imaginary machinery agoing: hence the varieties and contradictions in their ideal forces and laws of motion. For, when men abandon the evidences of nature and the lights of experience for the purpose of indulging their fancies in the invention of analogies and curious hypotheses, philosophy then sinks down to the level of romance, and serves to occupy the time of the indolent, or to amuse and captivate the credulous and ignorant.

But the thing that seems to have caused them the greatest inquietude and trouble, was what they termed the *vulgar prejudice* in favour of certain opposing passages contained in the Bible. This engaged Kepler, Galileo, Didacus à Stunica of Salamanca, Paolo Antonio Foscarini, a carmelite of Naples, Bishop Wilkins of Chester, and a number of others, to write largely in the way of attempting to reconcile, or rather of explaining away, all such passages as obstructed the circulation of their system. Many volumes were published for this extraordinary purpose; but as some of their *explanations* are sufficiently noticed in the course of the following pages, it is unnecessary further to advert to them at present.

It is somewhat remarkable, that those who revived the Solar System, should have adopted without hesitation, and without examination, Ptolemy's system of the distances of the heavenly bodies; while at the same time, their imaginations, contrary to the evidence of their sight, placed the fixed stars at rest, and, without the least shadow of proof, set the earth in rapid motion. Would it not have been more rational and prudent, out of respect to the senses of mankind and to religion, to have retained the ancient opinion of the earth being at rest in the centre of the universe; and then to have diligently ex-

amined, whether the too great distances which Ptolemy assigned to the heavenly bodies, might not upon scientific principles have been diminished? With this correction, and other improvements that might have been suggested by the accurate observations of modern astronomers, all useful and necessary purposes might have been answered; and Christendom might have been saved from that deluge of scepticism, which, amongst the learned, now so generally prevails. To me it seems a most singular and melancholy fact, that Dignitaries of the Church, and Heads of Colleges, should have been the foremost, and the most active, in this war against the sacred records; which they ought to have guarded as the ark of the holy covenant and by no means to have become instruments to hold them up to the derision of the sceptical Philistines. —For, as an inspired writer emphatically said,—IF THE FOUNDATIONS ARE DESTROYED, WHAT CAN THE RIGHTEOUS DO? *Psalm* xi. 3.

I repeat the words;—if the foundations be destroyed, what can the righteous do?—Destroyed, they cannot be; but if, for a time the foundations are even rejected, or removed, and men form codes of laws and systems of morals and philosophy, upon, comparatively, sandy bases, we see by experience the ruinous con-

sequences that inevitably ensue. The institutions of society must have some *fixed* principles to rest upon. Enough has happened in our own time to illustrate and confirm all that I mean by this observation. The more we depart from reason, nature and revelation, the more we expose ourselves to a perilous navigation amongst the ever-varying shallows and quicksands of wild hypotheses.

The philosophers, so called, have most certainly laboured hard, for two hundred years at least, to sap and undermine the very foundation upon which rests all that is essentially valuable in law, morals and religion,—the DIVINE HISTORY OF CREATION; which if discredited, so will be the account of the universal deluge, the tenth chapter of Joshua, and every other passage wherein almighty power is represented as operating in, by, and through the elements of created matter. The Hebrew people, who were instructed by the Supreme Mind itself, for the universal benefit of mankind, contemplated Divine Power as constantly present, working in all things in heaven and in earth; and so do even the poor Indians at this day: but modern refinements upon, what are termed, SECOND CAUSES, have a direct tendency to banish all such ideas from the human mind, and to leave it entangled in the webs of sophistry, or to wander amid the

cheerless and uncertain glimmerings of a false, barren, and delusive philosophy.

It is, however, satisfactory to reflect, that some of the brightest ornaments of our nation, to their great honor, discountenanced these attempts, and proved that their understandings were not to be entrapped in the flimsy snares of the mechanical sophists. I need only mention a few of the great names who flourished in the last century but one. Lord Bacon, Sir William Temple, Sir Matthew Hale, Sir Thomas Brown, and the Honorable Robert Boyle; these celebrated men, either declared the hypothesis of the Solar System to be chimerical, or they bore positive testimonies against it. So did the excellent Sir Henry Saville, the founder of the mathematical and astronomical professorships at Oxford, which still bear his name. The Honorable Edward Howard, of Berks, who understood astronomy well, in the year 1705 dedicated a book to the Prince of Denmark, titled, "Copernicans of all sorts convicted." In which he undertakes to prove, that "their hypothesis was astronomically, philosophically, and sensibly false to all impartial apprehensions." It may be reasonably presumed, that these distinguished and accomplished men, by their great knowledge acquired by learning, experience, reflection and extensive observation in

all things, were quite as capable of giving a true and impartial judgment upon the subject, as an equal number of monks shut up in their cloisters, or speculative mathematicians mostly confined to their closets.

I have said in another place, and I again repeat it; if we reject the testimonies of God concerning the origin and order of NATURAL things, who can vouch for those that are SPIRITUAL? It is an important question. The two together, may be considered, as the BODY and the SOUL of DIVINE REVELATION; and therefore the verity of both should be asserted: otherwise human institutions would fail, and human authorities would vainly endeavour, to preserve the salutary influence of the one part, while the other is rejected and trampled under foot. This is no imaginary statement of the case. If we reject those divine records which represent God as the creator of the universe; the mover of the heavens; as displaying His mighty power in the elements; as ALL in ALL; to what shall we look for evidence of His existence and omnipresence? It was by His power manifested in the elements that He MADE HIMSELF KNOWN to the people of old, both Jews and Gentiles: and in His own book, he threatens destruction to those who live in luxury, and " do not regard His work nor the

operation of His hands." It appears to me, therefore, that the attention of youth should be directed to the operations of this GREAT POWER, in preference to *that*, which, according to La Place, "*animates* the Solar System." The recommendation of that author's book, by a late professor, to the students under his care, accompanied by a caution against certain poisonous principles contained in it, does not appear to me to have been an act of wisdom. It is by the bewildering jargon of the sophists, concerning the imaginary forces of second causes, that men thoughtlessly suffer themselves to be drawn off and estranged from the GREAT FIRST CAUSE.

The publication of a work of seven hundred and fifty pages upon the constitution and economy of the universe, without even an allusion to a Creator, would scarcely have been countenanced under the heathenish institutions of ancient Greece and Rome. This, however, was done in France; received into the universities of other christian countries, and La Place was applauded for, (as it was said,) putting a finishing hand to the Newtonian System! This author has indeed said something about *nature;* but what he meant is not explained: One thing is, however, tolerably clear, and perhaps that explains his meaning; namely, that he imagined every particle of matter to

possess the inherent power of *moving itself!* Dr. Robison, professor of natural philosophy in the university of Edinburgh, at the close of the first volume of his "Mechanical Philosophy," gently remonstrates, and even reproves him for,—the *atheistical* tendency of some passages in his system of the world. He even expresses his *grief—after he had recommended the book to his pupils!* It would appear that the Doctor, in some degree, *felt* the dilemma in which the principles of the *mechanical philosophy* were involving its supporters, as PROFESSORS OF CHRISTIANITY. "It is somewhat *amusing*," says he, "to remark how the authority of Sir Isaac Newton has been eagerly catched at, by the *atheistical sophists*, to support their *abject doctrines*." Again, he remarks, "the *doctrine of universal fate*, is *now founded on Newton's great discovery of gravitation in the inverse ratio of the distances*." And in another place, "thus Newton, one of *the most pious of mankind*, was *set at the head of the atheistical sect*." The Doctor, of course, shows great zeal and anxiety to acquit the discoveries of his illustrious master, as he calls him, of all such baneful tendency, and he really appears to have lost his temper: as a proof of it, he makes a side cut at La Place's "CORSICAN MASTER."—"I was *grieved*," said he, "when I first saw

M. de la Place, after having so beautifully epitomised the philosophy of Sir Isaac Newton, conclude his performance with a *marked* and *ungraceful parody* on the closing reflections of our ILLUSTRIOUS MASTER."

You will recollect, Sir, that Newton, at the close of his "Mathematical Principles of Natural Philosophy," gives a rapid sketch of the system of *his own creation;* and in imitation of the Divine Creator, who on a general survey of his own stupendous works, "saw that every thing he had made *was very good;*" Newton, in like manner, on viewing *his work*, though his system directly contradicted the Divine one, magisterially declared it to be "most beautiful." Dr. Robison goes a little farther; for he says, "those who are *able* to follow the footsteps of Newton over the magnificent scene," (of his imaginary creation,) "must be affected as he was, and must pronounce *all very good.*" When Newton published his work, scepticism had made no great progress, excepting among a few mathematicians, and therefore, as he had begun his work, and even carried it on to the end, without deriving any assistance whatever from the Divine History of the Creation, it would seem, in order to give it currency, that he deemed it proper to father it upon some ideal BEING: he therefore declares, that "it could only proceed

from the counsel and dominion of an INTELLIGENT BEING." He then proceeds in lofty terms to declare what that Being *is* and what he *is not;* "to discourse of whom, from the appearance of things," says he, "*certainly belongs to natural philosophy.*"

From this it would appear, that, if we wish to know any thing about this Being, we must apply to the discourses delivered by the HIGH PRIESTS of GRAVITY and ATTRACTION! La Place having been furnished by Newton with POWERS, BEINGS, or SPIRITS, sufficient for *his purpose*, gives Newton a sly hit upon this passage of his book; hence the notice of the *marked and ungraceful parody*, which offended the sensitive nerves of professor Robison. Now, Sir, I call upon the disciples of Newton to point out a single passage in their books, concerning a Supreme Being, His nature, attributes and power, that is not infinitely excelled in the various revelations of Himself which he has been pleased to have recorded in His own book; or rather, I ask them to produce a single passage that will afford us any light whatever, on that important subject, that was not previously given by himself.

If indeed we were to rely upon the assertion of Sir Isaac Newton, that to discourse of the true God *certainly belongs to natural philosophy*; we should find, in the first place, as I

have fully shown, in the following pages, that the constant disagreement in opinions amongst natural philosophers, would leave us nothing to rest our judgment upon; and, in the second place, if we could seriously adopt the doctrines of Newton and his followers, concerning the perturbations, derangements and destructions which they pretend to demonstrate to be the inevitable consequences of the properties which they ascribe to matter, and to their laws of motion; we should form as gross conceptions of the Divine wisdom and power in the formation and economy of the universe, as the heathens generally did of his moral attributes in the government of the nations. Instead of contemplating him as a God of order, which he has declared himself to be,—we should consider Him in all things quite the reverse. In fact, our own works and our own imaginations would be the standards of our judgment concerning His power and His wisdom.

With regard to the moving POWERS introduced by Newton into his own system; he says "I have explained the phenomena of the heavens and *our* sea by the Power of Gravity: but I have not *yet* assigned the *cause* of this *power*; but am *certain* that it penetrates to the very centres of the sun and planets." He then adds, "hitherto I have *not been able* to

discover the *cause* of those properties of gravity from phenomena, and I frame no hypothesis." That is to say,—the cause of an imaginary power, as I have in another place fully shown. What! if such a powerful agent really exist, was he not able to assign the cause of its properties? Could there be any other than the GREAT FIRST CAUSE of all things? Could not this *most pious of mankind*, when he read the first chapter of Genesis, comprehend, that God himself created the peculiar essences, properties and qualities of all things, according to their different species, and for their respective uses? And could he not discover that whatever He, in the beginning, created, remains indestructible and essentially unalterable? But it was neither suitable nor convenient to his system, to refer to the first chapters of Genesis.

Having, in his void spaces, set his system of imaginary worlds agoing by his phantom of gravity, of the cause of which he declares himself to be ignorant, his imagination then, in his concluding paragraph, descends to the earth, and he mysteriously and oracularly tells us, of "a most subtile, electric, and elastic SPIRIT, which" he says "pervades and *lies hid*" (certainly no one ever saw or felt it,) "in *all* gross bodies. By the *force* and *action* of which *spirit*," (amongst other wonders, he

tells us of,) "*all sensation* is *excited*, and the *members* of *animal bodies move*, at the *command* of the *will;*" (what *will?*) "namely, *by* the *vibrations of this spirit*, mutually propagated *along* the *solid filaments* of the *nerves*, from the *outward organs* of *sense*, *to the brain*, and *from the brain into the muscles*. But these are things that *cannot* be *explained in few words;* nor are *we* furnished with that *sufficiency* of *experiments* which is required to an accurate determination and *demonstration* of the *laws* by which this electric and elastic SPIRIT *operates*." Had he been discoursing of *dead bodies*, he might have applied to resurrection-men and made his own *experiments*, or he might have attended at Surgeons' Hall and witnessed as many as he wished: but here he is discoursing of *living bodies;* and he brings forward a mysterious phantom, or spirit, as he terms it, to give sensation and motion to animal bodies; and this, without once alluding to a Creator, or, which would have been virtually the same,—to the first chapter of Genesis. But this spirit, it seems, he cannot fully unveil to us in a few words for want of experiments! Let us, then, see if we cannot explain all that can be explained on the subject, in a few words, and without experiments. Is not God the acknowledged source of life; and did not man derive his life immediately

from his Creator? And is not that life the cause of all sensation, motion and will? When that life leaves the body; do not sensation, motion and will cease? Can any thing more be said, or understood, of the matter? What then become of the vibrations of Newton's animating spirit, commencing its vibrations in the outward organs of sense, which are mutually propagated along the solid filaments of the nerves to the brain, and then proceed to give muscular motion! Ah! this was all that La Place wanted! Newton gave him TWO POWERS;—one to move inanimate bodies, and the other animated bodies. No wonder, then, that he sneered at *that* which Newton introduced by the by, considering it not only superfluous but dangerous. "Far from us," says he, "be the *dangerous* maxim, that it is sometimes useful to *mislead*, to *deceive*, and *enslave mankind*, to *ensure their happiness*." —That was the sentiment that raised the Doctor's ire; for he remarks upon it, and I believe truly, "more is meant than meets the ear." La Place has, however, done little more than spun and woven into a plausible mathematical dress the reveries of Spinoza and Toland, who had preceded him in the same cause; both had DEIFIED NATURE; and the latter, in particular, adopted the doctrines of, *motion being essential to matter;* a *plurality of*

*worlds*, and the DIVINITY of ÆTHERIAL FIRE. Toland, it appears, was the chaplain and secretary to the sect of the Pantheists; and a part of their creed, extracted from their liturgy, runs thus, "The ætherial fire; environing all things and therefore supreme —the æther is a *reviving fire*—it *rules* all things; it *disposes* all things—in it is *soul, mind, prudence.* This fire is Horace's *particle of divine breath*, and Virgil's *inwardly nourishing spirit*—all things are comprised in *an intelligent nature*,—this *force* they call the *soul* of the world, as also a *mind*, and *perfect wisdom*, and consequently GOD." This expresses more accurately than Newton's admirers are willing to allow, the meaning of the last paragraph of his Principia.

After maturely reflecting on these things, I am no longer surprised that those philosophers, who could admit the moving POWERS and SPIRITS of Newton, should overlook the GREAT FIRST CAUSE, and sink their views down to the level of MATERIALISM.

Professor Burckhardt, of Gottingen, in his account of the "construction of the comet of 1811," makes the following most wonderful remarks. "There is EVERY REASON to believe, that the nucleus of the present comet is nothing more than a CONGLOMERATION OF VAPOURS of very little density, so little per-

haps as to be transparent. Whether this be the case or not, might be easily ascertained, if those who are in the habit of observing it would watch the moment of its transit athwart the disk of some star, the rays of which would have sufficient power to perforate it, if transparent. Such a body might *very possibly* be AN INCIPIENT WORLD, JUST PAST ITS GASEOUS STATE, and which was to *derive solidity from the precipitation and condensation of the matter surrounding it.* The successive observation of some comets, in which it may be possible to distinguish the *different stages of chaos and progressive formation*, can alone furnish any knowledge with respect to this point." *Tilloch's Phil. Mag.*

Another passage, (taken from the *Phil. Trans.* 1812,) is no less extraordinary. "The brilliant appearance of our small comet, (of 1807,) may therefore be ascribed either to its having but lately *emerged* from a *nebulous condition*, or to having *carried off* some of the *nebulous matter*, situated in the far extended branch of its parabolic motion. The first of these cases *will lead us to conceive how planetary bodies*" (worlds) "*may begin to have an existence;* and the second, how they may increase, and, as it were, *grow up to maturity.*"

Here, Sir, you see the Newtonian doctrines, as they were unfolded by that philosopher to

his disciple Mr. Conduit, divested of their mask; the Divine account of creation in effect set aside; and the Epicurean system of atoms, as it was explained by Lucretius, openly proclaimed by the Royal Society of England to the whole world! The superstitious doctrine of the gymnosophists concerning the transmigration of souls, when compared to this, was quite innocent and rational. Let any one read and reflect upon the ALMIGHTY POWER and WISDOM, as it is described in the first chapter of Genesis, and in other parts of the sacred scriptures, and compare those accounts with these statements—of INCIPIENT WORLDS; CONGLOMERATIONS OF VAPOUR, just past their GASEOUS STATE; EMERGING from a NEBULOUS CONDITION, and gradually GROWING UP TO MATURITY! O wonderful, most wonderful! I can scarcely bring my mind to believe, that these learned men are not deliberately playing off experiments on human credulity; or that they have not a secret design to bring real science into contempt. However this may be; by their constant promulgations of wonders which none can discover besides themselves, for want, as it is pretended, of optics equally powerful as those which these philosophers possess, their opinions and doctrines are listened to and received with respect; their speculations are read before the

learned societies of Christendom, and actually recorded amongst their transactions without note or comment! Is it possible that those who conceive such doctrines, or, that those who receive them, can have read and believed in the Divine History of Creation; or, that they can even have seriously reflected upon the wonderful wisdom displayed in the formation of any one part of the real creation which is within their reach, and upon the abundance of which they are hourly enjoying themselves? In the real creation, which was put into our possession, there is enough to employ all our knowledge and all our energies, without having our attention perpetually called off to the wild creations of fancy: And I respectfully submit to your consideration, whether in the first formation of your learned society, such an employment of the intellectual powers was ever for a moment contemplated. It was instituted for the *improvement of* natural KNOWLEDGE. Our first father, Adam, was placed in the garden to *dress* and *cultivate* it; not to run out of it after shadows. If, however, our learned men, overlooking the duties imposed upon them by Divine Revelation, and by the nature and constitution of civilized society, will still persevere in publishing their romances; and if those who occupy the principal seats in our universities will still continue to approve and

encourage them, I shall continue to be decidedly of opinion, that all the whining—grief—and anxiety manifested by Dr. Robison, or any others of Newton's adulators, will be found quite inefficient in stemming the wide-spreading contagion of scepticism and infidelity.

The learned St. Paul, in the second chapter of his second epistle to the Thessalonians, mentions, that a time would come when there would be *a great falling away from the faith;* and that a certain thing would be revealed which he calls a *strong delusion*, and which he personifies as the man of sin "who exalteth himself *above all that is called God*, or *that is worshipped*, so that he *as God* sitteth in the *temple of God*, (the universe*) showing himself that *he is God.*" Who, or what, can this man of sin be, that is exalted to the attributes and prerogatives of Almighty God? For philosophers, so called, to attempt to substitute, even in idea, any other power in their imaginary and delusive creation and economy of the universe, is a monstrous conception of folly; and to publish it is, in my opinion, the blackest treason against governments and nations; inasmuch as it has a direct tendency to draw them away from a know-

* Thus saith the Lord, the heaven is my throne, and the earth is my footstool. *Isaiah* lxvi.

ledge of their Creator, and thereby to loosen, and even to cut asunder, every bond that holds civilised society together.

Does it then require any great stretch of imagination to believe, that the time of these *lying wonders*, as he terms them, is arrived? You, Sir, have had an extensive intercourse with learned men, and you must therefore be well acquainted with their sentiments, by conversing with them and by reading their books. You will see further on, in the same chapter, that God will destroy this *delusion* "by the *spirit of his mouth*, and with the *brightness* of his coming;"—by the POWER and SPLENDOUR of TRUTH. Several eminent men have expressed their feelings with a lively concern upon the same subject. The Rev. William Jones, who was justly deemed an ornament of your society, differed with Newton upon some important points; and, in the introduction to his *Physiological Disquisitions*, he thus delivers his sentiments. "Late discoveries have again filled the world with matter, and revived the knowledge of those powers which the heathens knew and worshipped. A vacuum is, or will be forgotten; and the elements are likely to be restored, as of old, to their proper offices in nature, I have long foreseen, or feared I did, that whensoever this should come to pass, the light of

christianity, with all the warnings and threatenings of the scripture, would scarcely be found sufficient to secure us from relapsing into the ancient error, and taking once more *the elements for the Gods that govern the world;* ascribing intellectual powers to organised matter, and smothering the distinction between body and spirit; which is the philosophy of *materialism;* an unhappy system, which has always had its advocates, but can recommend itself only to the half learned, inflated with the vanity of false wisdom, and destitute of the principle which the scripture calls by the name of FAITH. In this plan, I have no share: and it is part of the design of this work to guard the *learned* against it, and point out a more excellent way."

It would indeed be well, if practicable, to guard the *learned* against these things. As for the mass of the unlearned, I hope there is no great danger; for, as they generally make use of their senses, they feel but little interested concerning doctrines, in which philosophers magisterially teach, that the senses can render no discriminating assistance—that they are in fact *illusory.* The unlearned are, besides, attached to an ancient opinion, that the senses were given to man, as beneficial guides to real information respecting natural phenomena; our fathers have instructed us to make use of

our senses, and experience convinces us that we ought to do so. The system of *philosophy* in question is, I believe, the only one ever promulgated, in which the aid of the senses has been contemned and proscribed; for no other reason than because they constantly bear witness against it. But as, in the progress of this delusion, those who make use of their senses, may suffer by the arts of those who oppose and reject them: it seems high time seriously to enquire, whether the senses and the scriptures were given to deceive us; and whether we are to surrender both, for the sole purpose of allowing philosophers an open field to juggle mankind out of all that is safe, practical and useful; and, instead of which, to introduce all sorts of inanities and pernicious romances? It is of importance to enquire, whether the authors and promoters of such principles are (perhaps undesignedly) the great pioneers of revolutions? For, if the FOUNDATIONS are removed, nothing can stand; nor can any thing solid and durable be erected. It is further of importance to enquire, whether the great giants and architects of blasphemy, are to be flattered, applauded and raised to honors, while the pigmies and retail venders, are to be punished and put down? Above all, it is of great importance seriously to enquire, what power we should look to as the

creator, the governor, and the preserver of the universe? Whether to the imaginary power, or powers, which philosophers have proudly raised up in the temple of nature, or to the real One, which, as the people have been taught to believe, created and sustains all things? Whether princes, governors, magistrates and people, are to look for safety and protection to the self-moving atoms of Epicurus; the ætherial fire of Toland; the moving and animating powers and spirits of Newton and La Place; or to the One God revealed to them in the scriptures. Whether we are to believe the dogmas of those philosophers, or the Books of Moses and the prophets? And, lastly, whether we are any longer to consider Divine Revelation the main pillar of thrones and governments, and the firm rock upon which to found the stability and prosperity of all nations? I hope these enquiries will, before long, be seriously instituted: for my own part I should feel no anxiety as to the issue. And I further hope, that when you have read and reflected on what I have written, I shall not be asked, as a physician to His late Majesty once asked one of the learned members of your society, "What has religion to do with philosophy?" But he was not singular in that opinion; it is too common. Others, holding similar views, pre-

sumptuously demand to know, "what religion has to do with politics?" Thus, they would dispense with the Divine Government both in heaven and in earth: they would thus appropriate all the glory to their own plans and to their own management, and pilfer to themselves what exclusively belongs to God. Is it not therefore high time to remove "the accursed thing" from the camp? Until this be done, all attempts to suppress blasphemy will be utterly in vain.

Many learned and excellent men have clearly seen the fallaciousness of Sir Isaac Newton's principles of creation and of planetary motion; and likewise the pernicious tendency of his leading doctrines; and they have, from time to time, attempted to introduce other hypotheses of their own, that would have been more consonant to our senses, and of course less contradictory to the sacred writings: but it has been all in vain to attempt to oppose hypothesis to hypothesis. Most, if not all of them, seem to have taken for granted the applicability of his real or imaginary experiments and the truth of his assumed facts, without ever putting them to the test of examination: it seems to have been gratuitously admitted, that his system rested upon a mathematical basis: but the truth is, that the foundations of it are altogether imaginary and

fallacious, and therefore all his mathematical diagrams and ratios grounded thereon are false and delusive. That excellent man and most accomplished scholar, Mr. George Walker, lately a member of your society, in the close of his Essay on Learning and the Arts, has adverted with great force and elegance to the sceptical productions of Spinoza, Hobbes, Lord Herbert, Chubb, Tindal, Hume, Rousseau, and others; but the insidious works of the great mathematical sophists seem to have escaped his notice: had he even suspected their impositions, his great abilities would have enabled him to have thoroughly detected them, and, I am persuaded, that his integrity would have armed him with resolution to have publickly exposed their delusions to the world. I have given ample proofs of the pernicious consequences to which the main dogmas of this philosophy inevitably lead: is it not therefore a DUTY to examine the *grounds*, if any, upon which they rest? And if they are found to be fallacious and therefore untenable, is it not likewise a duty to try to substitute something else in the room of them? Something with which our senses, our reason, and the scriptures shall all harmonize?

Under these impressions, I have diligently examined the Solar System, which compre-

hends the Copernican, Keplerian and Newtonian hypotheses. In this system every thing is inverted and exaggerated, and my first book, which I now present to you, is appropriated to an exposition of the false bases upon which it rests. I might have extended my comments upon it to the size of a large volume; but it is fighting with shadows, and I have no wish either to take up the time of my readers, or to fatigue myself further upon so unprofitable a subject. What I have written I deem to be quite sufficient for the purpose of holding it up to the scorn and reprobation of every intelligent and reflecting mind.

In my second book, which I hope to have soon ready for the press, I have formed a system that will neither contradict the scriptures, nor oppose the experience of the senses; one which will prove, that there is no occasion for the imaginary expedients of earthly motion, incredible distances, magnitudes, and velocities; that wholly dispenses with the mathematical fictions of the theory of gravity, projectile forces, and all the perturbations ascribed to them; that rejects the unfounded doctrines of void spaces; the deformities of elliptical orbits and oblate spheroids; the superstitious multiplication of imaginary worlds; together with all the inflated rodo-

montades of world-destroying, and sun-feeding comets.

My plan combines what is solid and useful, but rejects all that is hypothetical and false, in the systems of those who have gone before me. It rejects the solid orbs of Callippus and Aristotle, but admits, with them and Ptolemy, the immobility of the earth; the diurnal motion of the heavens; the unchangeable positions of the fixed stars in reference to each other, and their invariable latitudes to the ecliptic: but it rejects Ptolemy's epicycles, the immense distances he assigned to the planets, and his supposed positions of the centres of their orbits. It so far agrees with the system of Tycho Brahe as to admit nearly his arrangement of the planetary courses, with the exception of his epicycles and his Ptolemaic distances. The mixed system of Ricciolus, formed upon the scheme of Heraclides and Ecphantus, as mentioned by Plutarch, is of no importance to be noticed, because it ascribes a rotatory motion to the earth, but none in an orbit.

The distances I have adopted and demonstrated, leave no room for any other worlds than the one which God has informed us He created for the use of man and the other creatures which he placed upon it. I have proved that the planets move in circular

orbits; such only being natural to them; and from such, distances and such orbits as I have described, I have by easy mathematical calculations deduced the principal equations.

How far I have succeeded in promoting the interests of useful science, the learned will hereafter judge: and, as I do not write with lucrative views, I trust they will give me credit, at least, for friendly intentions. The grounds I have taken I know to be solid, and I shall leave them to others to build and improve upon as may be deemed useful and proper.

In thus submitting my performance to you, Sir, to be laid before the illustrious society over which you preside, in case you should think it proper to do so, I merely discharge what appears to me to be an act of duty.

I have the honor to be,

Sir,

Your most obedient servant,

B. PRESCOT.

*Houghton Street, Liverpool,*
10*th March*, 1822.

P. S. On looking over a catalogue of Sir Isaac Newton's manuscripts and papers, as annexed to a bond, given by Mr. Conduit to the administrators of Sir Isaac; by which he obliged himself to account for any profit he might make by publishing any of the papers; I find that Newton treated on the following important subjects; namely, *Church History; Prophetic Style; Temple of Solomon; The Sanctuary; Corruptions of Scripture; Paradoxical questions concerning Athanasius; Working of the Mystery of Iniquity; Theology of the Heathens; Account of the contest between the Host of Heaven and the transgressors of the Covenant; History of the Prophecies.* Dr. Pellett, it appears, by agreement of the executors, entered into acts of the Prerogative Court, and was appointed to peruse all the papers, and judge which were proper for the press. He accordingly did peruse them, and judged those enumerated above, *not fit to be published.* One cannot help enquiring, *why* they were not fit to be published? We have been told over and over again, that he was sent by Heaven to remove the veil that covered nature, and to enlighten mankind; and yet, notwithstanding that assurance, we have evidence laid before us, that he, with incalculable pains, wrote perhaps eight or ten folio volumes, upon the most important matters, which were *not fit to*

*be published!* "It is astonishing," says his biographer, "what care and industry Sir Isaac had employed about the papers relating to Church History, Chronology, &c. as, on examining the papers themelves, which are in the possession of the family of the Earl of Portsmouth, it appears that many of them are copies over and over again, often with little or no variation; *the whole number being upwards of* 4000 *sheets in folio, (*16000 *pages!) or* 8 *reams of folio paper, beside the bound books, &c.* in this catalogue, of which the number of sheets is not mentioned. Of these 4000 sheets, exclusive of the bound books, there have been published *only* the Chronology, and Observations on the Prophecies of Daniel, and the Apocalypse of St. John." There must be some great mystery in the condemnation and suppression of this mass of the *pious labours* of this "Pride of the Seventeenth Century," as the Monthly Reviewers term him,—this "name which far surpasses that of Princes."

# CONTENTS.

# CHAPTER I.

INTRODUCTORY REMARKS; ON SCEPTICISM; THE DOCTRINE OF A PLURALITY OF WORLDS; INFORMATION OF THE ANCIENT HEBREWS IN THE ARTS AND SCIENCES, &c.

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THAT illustrious character, whom the Almighty God raised up to be a leader and instructor to the Hebrew nation, and, through them, to give laws to the world; when he had conducted them to the borders of their destined inheritance, he crowned the labours of his divine mission by that memorable charge which he delivered when committing to their custody the Sacred Books. Having impressively contrasted the infinite advantages of obedience with the fatal consequences of rebellion against the divine precepts, he emphatically reminded them of the many awful events of which they had been eye witnesses, as being so many unquestionable evidences of the superintending care, unbounded power and constant presence of that awful Being by whom those statutes were revealed. These statutes he therefore enjoined them perpetually to meditate upon—to teach to their children from generation to generation, and for ever to prize the inestimable gift as their own peculiar inheritance. But concerning such matters as God had reserved to himself and not revealed, which philosophers and divines wrangle so much about, he seemed to discountenance vain curiosity, or presumptuous interference, as being exclusively the divine prerogative. "The *secret things*," said he, "belong to

Jehovah our God, but those things which are *revealed* belong to us and to our children for ever, that we may do all the words of this law."

Now as the historical accounts of those marvellous displays of divine power, which the whole nation had witnessed, were accompanied by and interspersed in the body of the written laws; and the whole deposited with them in the most solemn and open manner by the very man who had for forty years acted in their presence, as the distinguished instrument of omnipotence; those records were of course received by the whole nation as incontrovertible memorials of eternal truth; and as such they have been perpetually embraced, preserved and handed down from generation to generation, as we see them at this day.

If the Hebrews had not certainly known the historical facts recorded in the Books in question to be undoubted divine truths, they never would have received them as such: much less would they have preserved and defended at the risk of the loss of their property and lives, for more than three thousand years, records, which so far from flattering false prejudices or encouraging evil propensities, are principally filled with admonitions against immoral indulgences or criminal acts; the penalties of disobedience; the catalogues of their offences and the consequent punishments of Divine Justice. Therefore, for these and an abundance of other reasons which might be produced, every intelligent man, who seriously considers, that all effects are necessarily produced by corresponding causes, and who in other respects cultivates ratiocination with a due regard to useful information, ought, I conceive, upon the most solid grounds of argument, to admit, that the revealed communications in question are strictly authentic and divine.

There are many persons, notwithstanding, who following the example of others, or for want of sufficient industry to examine the Volume with due attention: being also probably puffed up with imaginary science, or unwilling to view themselves by that light which exposes false positions; have in this age embarked in a war of opposition to those divine testimonies; and have even published books for the avowed purpose of crying down the credibility of their contents. They have represented them as not only opposed to philanthropy and sound morality; but likewise to what are termed the sciences, as well as to the useful and elegant arts of civilization. I suspect however, that if such opposers would express their real thoughts upon the matter, with the candour they profess, the true ground of their hostility would be found to exist in the opposition which that renowned Volume exhibits against the maxims and the practices of libertinism; the views of the seditious; and the inflated pride of the vain sophists.

But it would be foreign to the subject in hand to notice at considerable length the shallow and erroneous views of such writers. I shall quote only a passage or two from one of the most plausible of them, for the purpose of shewing how undeservedly a man may become extremely popular among the inconsiderate. This man set himself against both divine and human institutions: and an ill formed understanding, with an uncommonly arrogant disposition, seem to have peculiarly fitted him for the hardy undertaking. The following passages are not selected because they contain more falsehood than others of equal length in other parts of his books, but because they touch upon the subject which I am about to discuss, and also corroborate the observations I have just made.

"Though," says he, "it is *not* a *direct article* of the Christian system, that this world which we inhabit is the whole of the habitable creation, yet it is so worked up therewith from what is called the Mosaic account of the creation, that to believe otherwise; that is, *to believe* that God created a plurality of worlds, at least as numerous as what we call stars, *renders* the Christian System of Faith at once *little* and *ridiculous;* and scatters it in the mind like feathers in the air. The two beliefs cannot be held together in the same mind, for he who thinks that he believes both has thought but little of either."

It certainly *is* a *direct article* of the Christian faith to *believe the first chapter of Genesis*, which mentions the creation of *one* habitable world only. It is evident that Christ and his Apostles believed in that chapter, by their occasional references to the authority of it. How one thing can be *rendered ridiculous* by *believing* in another, without knowledge, I cannot conceive. It is clear from what follows, that he had investigated very little into the principles of either system; and, respecting the one he adopted, he seems to have been as credulous as a devotee at Loretto who believes all that the priests tell to excite his wonder and fanaticism.

The same writer, after having described what he terms the worlds of the Solar System, and dogmatically assured his readers, without offering, or being in possession of a single proof in support of his belief, that "the circumference of the Solar System is five thousand millions of miles," goes on to give *proofs* in confirmation of his belief in the existence of millions of worlds;—they are no doubt as strong as any others he could have adduced, but, unluckily for his object they fail,—they are no proofs at all. But let them speak for themselves.

"If," says he, "it should be asked, how can man know these things? I have *one plain answer* to give. *Which is* that man *knows how to calculate an eclipse*; and also how to calculate to a minute of time when the planet Venus, in making her revolution round the Sun, will come in a straight line between our earth and the sun, and will appear to us about the size of a large pea passing across the face of the sun. As *therefore* man *could not be able to do those things if he did not understand the Solar System*, and the manner in which the revolutions of the several planets or worlds, are performed, *the fact of calculating an eclipse, or a transit of Venus, is a proof in point that the knowledge exists.*"

No, no, that is no proof in point that the knowledge exists—it proves nothing more than the ignorance and extravagant presumption of the writer. The science of calculating eclipses was known some thousands of years before computations were formed upon the hypothesis of the Solar System; nor is it of any real use in such calculations. The writings which are extant of Ptolemy;* the Arabian astronomers; Tycho Brahe, and others, sufficiently prove the falsehood of his assertions: were it not for the assistance derived from their works, or others compiled from them, there is not a Newtonian who could calculate an eclipse at all. Therefore the positive asser-

* Mr. Good, in a note to his recent translation of "De Rerum Natura," says, "It is curious enough to observe that in the science of geography the old theory of Ptolemy is *yet*, ostensibly at least, adhered to, and the sun is still represented as travelling round the immoveable earth; an absurdity which is infinitely perplexing to children, and which cannot too soon be relinquished." Be assured, Mr. Good, the theory of Ptolemy, or rather the certain evidence of the senses, cannot be relinquished: to attempt such a thing, in the education of children, would indeed be madness; and if any teacher could have the folly to attempt it, even the very children would laugh in his face. The Creator, in the beginning, irrevocably ordained such an inseparable union, harmony, and correspondence

*be published!* "It is astonishing," says his biographer, "what care and industry Sir Isaac had employed about the papers relating to Church History, Chronology, &c. as, on examining the papers themelves, which are in the possession of the family of the Earl of Portsmouth, it appears that many of them are copies over and over again, often with little or no variation; *the whole number being upwards of* 4000 *sheets in folio, (*16000 *pages!) or* 8 *reams of folio paper, beside the bound books, &c.* in this catalogue, of which the number of sheets is not mentioned. Of these 4000 sheets, exclusive of the bound books, there have been published *only* the Chronology, and Observations on the Prophecies of Daniel, and the Apocalypse of St. John." There must be some great mystery in the condemnation and suppression of this mass of the *pious labours* of this "Pride of the Seventeenth Century," as the Monthly Reviewers term him,—this "name which far surpasses that of Princes."

Some writers I know wish to defend the credit of both systems, and, by curious criticism on certain Hebrew words, they endeavour to reconcile them; but it is in vain to attempt it;—as soon would gold and chaff unite in the constitution of one solid compact body. In the one, divine information, sense, and reason harmonize; but, by the dogmas of the other, all are opposed and contradicted. Both believers and unbelievers in divine revelation, have long since made their election in favour of the human system; but whether it be of that belief which preponderates in the scales of truth, the wise in all nations will I hope, before long, attentively examine and judge for themselves. My own opinion, however, is, that the sceptics have not even attempted seriously to place them in the balances; and moreover that they have not scrupled to adopt artful plausibilities upon the mere credit of the propagators of them, at the same time that they have rudely dismissed the sublime and venerable majesty of truth, eradiated with light and surrounded by a numerous assemblage of evidences, natural, human and divine, of all ages and all civilized nations. Such conduct is certainly no proof of the present being the age of reason, but it sufficiently proves, that many despise its influence and speak evil of those things which they know not. But I am not at all inclined to inveigh with severity against this class of writers, though in general their manner is sufficiently illiberal. That they have heartily joined in a war against the beneficent dispensations of the Almighty to man, is certain; but they have fought only with the weapons of those who combated before them in the same warfare: therefore they must be left to the decision of truth, which, though simple in its form, and, at present, to appearance, but weak in its means, will in due time, I trust, like the sling stone

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the ancients; there is scarcely any absurdity too gross for their adoption. A philosopher of the same sceptical sect, whose writings are pretty voluminous and who by that class of reasoners has been highly praised;* endeavoured, about twenty-six years ago, to persuade himself and his readers, that the infirmities of age might be prevented if people would only persevere in the exercises of youth; and he really seemed to think that even immortality itself depended upon our own will! The spirit of fanaticism is always the same and produces the like effects, whether operating upon philosophers or religionists; it leads men to despise experience, and to adopt and act upon whatever notion may be blown into the mind, without ever bringing it fairly to the test of reason and nature; which renders them liable to be driven about like weather-cocks by every wind of false doctrine, or to be entangled in a thousand snares and labyrinths of literary plausibilities: while at the same time the Book of Truth is passed by unheeded, though its steady and ever-during light was designed in the first place to lead men to the pure principles of unerring science, and then to admonish them of the consequences of rejecting the inestimable benefits imparted.

The Almighty having in the beginning, by his infinite wisdom, planned; and by his almighty power called into existence the stupendous fabrick of the universe, concluded his glorious works by pronouncing that every thing he had made was good; and commanded a record to be made of the divine order of succession in which the various parts of visible matter, as well as the principal distinctions of animated creatures, were produced. To the mind of man, as a reflex mirror of the world, he

* The author of "*Political Justice*, &c." Condorcet is said to have held the same opinion.

gave faculties of sense to enable him truly to discover, and also rational and contemplative powers to consider the whole that had been created; to compare the harmony of operation with the fidelity of description; and to behold in both the ever existing monuments of his glory and of his beneficence to all creatures, but pre-eminently to man, whom, under himself, he had invested with the universal dominion.

With these divine advantages;—with the face of the whole creation open to his view, and the account of God himself in confirmation of it, as it appears to the eye;—how astonishing it is, that man should be so entirely regardless of the inestimable talents of reason and sense, as to allow both to be completely duped by the idle and impious arts of vain and interested sophists, and to believe, that the frame and operations of nature are diametrically the reverse of what he sees,* and, likewise, of the information the Maker himself has given in his own book, to which the powers of the mind, when not confused by philosophical figments, have in all ages borne an uniform and full testimony.

The object and intent of this essay is, therefore, to expose the false grounds of human opposition to the sacred books, and to vindicate their divine authority, so far as they are illustrative of the subject in hand;—to show that they do not contradict, but are strictly consonant to the internal powers of reason as well as to the external observation and evidence of the senses; that they are not intended, as vain philosophers daringly insinuate, to conform to the false prejudices of those whom they

* These philosophers ought to have taken a hint from their ancient master Epicurus, "The senses," said he, "are the criterions of truth, and it is not possible to confute them."—Cicero also enquired, "What can possibly be conceived, if the senses do not report faithfully?"

term the Vulgar; or, in other words, to deceive; but the direct reverse: and I hope that an imputation so scandalous will speedily receive, from those in all nations who are friendly to the cause of truth, the reprobation it so justly merits.

But why, said a Newtonian to me some years ago, do you wish to deprive God of the honor due to him for having made so many worlds, why limit his creation to this world which we inhabit? The exclamation of Pliny the naturalist on the same subject might have been a sufficient reply. "A ridiculous folly it is," said he, "of all other follies, to go forth of it (the earth), and so to keep a seeking without as if all things within were well and clearly understood and known already." But a very obvious question presents itself. Are we professors of Paganism or of Christianity?—do we found our rules of faith on Greek fable or revealed truth? If on the latter, then I answer, that in God's own account of the creation of the heaven and the earth, he only mentions or acknowledges the creation of one world, nor does he in any part of his own book require us to praise him for more; but he certainly does require us to praise him for all the wonderful works which he has described in that book. Therefore my reasoning can only have a tendency to deprive visionary philosophers of the presumptuous glory of their own imaginary creations, which, in order to give them currency, they condescendingly father upon Him, after taking to themselves the credit of finding them out. For truly the new discovery of an old star, by a modern optician, is considered a most interesting and highly important event, though the world we live in they term an "insignificant point!"

One of these speculators, while dilating upon this subject, gravely felicitates himself in these words;

"The discovery of the Georgium Sidus may be looked upon as the *happy presage* to future *success!*" The presage was accordingly realized in the discovery of others some years afterwards; and if astronomers will continue closely to examine the ample field, I believe many more may be detected; but I suppose that, in future, such discoveries will not be permitted to rank with the one above mentioned; they must not be allowed to tarnish the glory of *that;* the rank that such are to hold, in the scale of celestial discoveries, appears to have been fixed by the discoverer of the first. They are not it seems to be considered as noble worlds, but to have a petty distinction—an inferior title;—namely, ASTEROIDS. "Asteroids," says he, "are celestial bodies which move in orbits either of *little* or *considerable* excentricity, round the sun; the plane of which *may* be inclined to the ecliptic in *any angle whatsoever*. Their motion *may* be *direct* or *retrograde;* and they *may*, or *may not* have *considerable* atmospheres, *very small comas*, *disks*, or *nuclei*." Such is the remarkable definition of a great astronomer! and therefore few will venture to call it in question. The "happy presage" has however been realized; and as these learned calculators seem to be far more gratified with multiplicity than utility, they go on to assert, that "it is from *modern* astronomy we learn that the stars are innumerable,* and that the constellations in which the ancients reckoned but few are now known to contain thousands. The heavens of Thales and Hipparchus were *very poor* when compared with Tycho Brahe, Herschell, &c." Very *poor*, truly! Probably in ancient times the heavens did not produce so many professorships; nor the riches of so many manufactories

* The *moderns* only confirm what the *ancients* asserted. *The Host of Heaven cannot be numbered.* Jer. xxxiii. 22. Democritus taught, that the milky way contained *an innumerable multitude of Stars.* PLUT.

of telescopes:† they did not produce so much employment for a multitude of writers, teachers and lecturers on imaginary things, nor did booksellers then, as now, enrich themselves by the sale of thousands of volumes treating expressly upon the exact degrees of ponderosity, attraction, gravitation, and repulsion of bodies said to be situated at the distances of hundreds and thousands of millions of miles! Alas, alas, how barren were the heavens in those days! The poverty of the ancient system was I suppose its greatest disadvantage: had it not been for that, I imagine its credit never would have been so vigorously assailed. It has been supplanted by a profitable system, which will remain as firmly established as was the credit of Diana at Ephesus, until the Revelation of Truth unmasks the imposture. The preaching of St. Paul produced a terrible commotion amongst the promoters of delusion in that city. Demetrius, therefore, who was largely engaged in the commerce of deception, became alarmed and exceedingly enraged. He cried out, "Not only this our *craft* is in danger, but also that the temple of the great goddess Diana should be despised, and her magnificence destroyed, whom all Asia and the world worshippeth." The praise of Diana, and her magnificence, no doubt greatly promoted trade in that city, and the spring of Demetrius's zeal, as well as of those workmen who sided with him and raised the uproar against the ambassadors of truth, evidently centred in the large profits produced by the manufacture and sale, to different nations, of the silver shrines and images: therefore as the history informs us, they were full of wrath; and in order to drown the voice of truth, they, for about two hours vociferated, Great is Diana of the Ephesians!

† Which this writer largely dealt in.

There is something like the same spirit in these days; and experience proves that where feelings of interest, or an ardent desire of pre-eminent distinction, are the ruling motives of action, neither the sacred obligations of the pulpit, nor the dignity of the professor's chair, are effectual preservatives against the perversion and prostitution of reason for the promotion and establishment of lucrative, though false, systems. And when such have been long established, though encreasing in deformity as they encrease in age, they are sure to find numerous defenders, not only among those who find them to be gainful concerns, but likewise among such as are the dupes of the imposition; nor is it an unusual artifice to class all such as testify against the fraud, of whatever nature it may be, with the opposers and blasphemers of religion.

But I leave this digression and proceed with my comments upon the old fable of a plurality of Worlds, which the Newtonians have so elaborately vamped up anew. It is a doctrine, when attentively considered, that seems to be the necessary consequence of the peculiar structure of the Solar System; being in a manner expedient to support the agreement of its parts. Because having once imagined a diurnal and an annual revolution of the earth instead of the sun; analogy in reasoning requires, that several little stars, called planets, be raised to the same rank, and also that, in imagination, they be swelled to enormously large sizes to correspond with that rank; and then after having supposed them to be several thousands of miles in diameter, rules of optics require their distances to be estimated proportionally great, so as to agree with appearances. Thus, for the sake of forming an imaginary system, all things are to be deemed the very reverse of what they

appear to the eye; and volumes must be written in attempts to render the fabrication palatable. The inspired writers must be declared ignorant of the very subjects they wrote upon! A celebrated speculator on this philosophy, in the course of one of his rhapsodies, has the following extraordinary passage, which is praised and copied by another.

"The sparkling points with which it (the firmament) is sown, are so many *suns* suspended by the Almighty in the immensity of space; to give light and heat to the *worlds* which roll around them. *The heavens declare the glory of God, and the firmament his handywork.* The royal poet who expresses himself with such loftiness of sentiment was *ignorant* that the stars he contemplated were in *reality suns.* He anticipated the times and first sung that majestic hymn which future, and *more enlightened ages,* should chaunt forth in praise to the *Founder of Worlds.* The assemblage of these vast bodies is divided into different *systems;* the number of *which* probably *surpasses the grains of sand which the sea casts upon its shores.*"

If this comparative estimate do not satisfy the most ardent cosmogonist of the Solar System, I cannot imagine what will. It certainly is quite consistent in those who receive such a creed to assert, that it "scatters the Christian system like feathers in the air." Truly, a well grounded belief of both systems cannot be held in the same mind;—the truth of the one most clearly demonstrates the falsehood of the other.

I have no conception of any solid satisfaction that can be derived from thoughts so confounding to the mental powers; to me it seems they can only have a tendency to fill the mind with the perplexities of doubt, or the most melancholy reflections; such as it may be con-

ceived a man ignorant of providence must experience, if turned adrift in a small boat, without compass or guide in the midst of the trackless ocean—without information of his situation, or knowledge to direct him to a haven of rest, his soul would sicken and his hope founder in despair.

What, in idea, becomes of the revealed system of the world?—where can the reflecting powers of the mind find an object to rest upon, if it is to be believed that systems of worlds surpass in number all the grains of sand upon the sea shore? Or if, according to the enormous computation of another astronomical optician, we are to believe, that if a single grain of mustard seed were placed several feet from the eye, it would occupy a visual angle equal to a nebula consisting of millions of systems of worlds, condensed by gravity into what he estimates the comparatively small space of five hundred times thirty-eight millions of millions of miles!! They first *imagine* that the little crystalline glittering points which adorn the heavens, called fixed stars, are *suns;* and having imagined it, the next step is *positively* to *teach it* as *sound doctrine;* with the further assurance, that those little points have worlds whirling round them, though neither analogy in sound reasoning, nor the evidence of the senses, can in any way support the assertion; for they never yet saw any thing moving round them. If however we hesitate to take their word for it, they insult us in the following terms. "Proud and ignorant mortal! lift up now thine eyes to heaven and answer me, *if one of those luminaries were taken away* which adorn the starry heavens, would thy nights *become darker?* say not then that the stars were made for THEE; that it was for THEE that the firmament glitters with effulgent brightness."

No doubt the night *would become darker* if even *one* were to be *taken away*, comparatively as would a large room lighted up by a thousand lamps if *one* were to be taken away. It is by the combined light of those stars which are above the horizon, that we are enabled to travel about in the night when the moon is absent; for, were it not for the stars, the firmament would appear quite black and of course the darkness on the earth would be intolerable. So that if the matter be duly considered it will be found quite reasonable to receive God's account of it in preference to that of the enthusiast whom I have quoted. Undoubtedly the stars were made exclusively for the inhabitants of this earth:—"For *signs* and for *seasons* and to give *light upon the earth.*" These are the important benefits derived from them. They serve as *signs* or *marks* for geographers and travellers by land and sea, to lay down and discover the situations of places upon the surface of the globe, which could not otherwise be done. And by the uniform and perpetual revolution of the constellations, all nations are apprised of the regular succession of the seasons, comparatively as a clock shews the hours of the day and night. Therefore the Creator distributed them in all parts of the heaven in order that all nations might participate of the important services which they render to man. As Moses says to the Israelites when prohibiting the worship of them; (Deut. iv. 19.)"Which the Lord thy God hath divided unto *all nations* under the *whole heaven,*"—alluding to the account stated in the first chapter of Genesis, referred to above.

The idea of a multiplicity of stationary suns and worlds whirling about them; or of contemplating the Creator as a "founder of worlds;"—as a manufacturer of innumerable "*balls,*"—sending them with incon-

ceivable velocity by the Newtonian *projection* into illimitable space, appears to me, so far from exalting his divine Majesty, that a notion so absurd and puerile could only have originated in a vain and imbecile imagination: and therefore must have a tendency to detract from that honor which we ascribe to him for the greatness, excellence and beauty of his works, and for the incomparable harmony every where manifest in the motions of the divine system.

Even when we examine the works of human art, it is not the *multitude* of them that excites our admiration, so much as the genius and wisdom displayed in the execution. Had every city and town in the world possessed structures equal to the magnificent temple of Solomon at Jerusalem; to that of Diana at Ephesus; to the pyramids of Egypt; or to the colossus at Rhodes; sentiments of admiration of them would scarcely have been excited, because such wonderful works would have been common. That small but supposed unequalled piece of sculpture lately at Florence, but now at Paris,* when examined by judges of refined taste and extensive observation; they are constrained to acknowledge and extol the transcendent powers of the artist who formed it; but if that exquisite specimen, which has held up the name and talents of Cleomenes the son of Apollodorus† to perpetual praise, had been multiplied into millions, admiration of it would long since have ceased; and instead of contemplating the abilities of the artist with applause and astonishment, his fame would, in the estimation of the world have sunk to a level with that of manufacturers of common forms, and his productions would in consequence have been neglected as uninteresting lumber.

* When this was written: † Or whoever was the artist.

The immortal part of man, whatever he may vainly profess upon the subject, can neither be truly delighted nor really satisfied in brooding over an universe composed of countless ideal systems of matter, separated by imaginary void spaces of inconceivable extent. Man possesses an ever active and ever living principle which looks beyond perishable matter, of which he cannot comprehend the formation of the least particle; nor would the possession of the whole globe make him happy; having nothing in it that can fully satisfy, or be compared with, the desires, expectations or attributes of his imperishable part. Why then vainly busy himself in falsely imagining, and then presumptuously writing down upon paper to deceive others, his fantastical creation of innumerable globes of matter? This employment is however what we are to understand and to receive, according to the sceptics, as " rational religion!"

The mind of man is, I believe, when unsophisticated, a faithful mirror to reflect true ideas of the word and works of God; and that it is owing to the misuse or neglect of the faculties which he has given to us, that all dangerous errors in philosophy as well as in religion have originated and spread: to illustrate which, numerous examples might be produced. But perhaps there is none more strikingly remarkable than the substitution of the Pythagorean fable, by the Christians, for the true account of the universe so plainly described in the sacred books from which they profess to extract the elements of their religious faith. Such indeed is the implicit belief of learned men in the perfection of the Pythagorean dogmas, that it seems to be believed amongst them, that the elements of several of the most important branches of science originated in that school.

A learned minister of the Christian faith, recently published, in a note accompanying his translation of Herodotus, that "it is to the disciples of Pythagoras that the *world* is *doubtless* indebted for the discovery of *numbers*; of the *principles of music;* of *physics* and of *morals*." This, as coming from, or sanctioned by, a clergyman, is certainly a most extraordinary passage. If the world owes those precious acquisitions to Pythagoras, how shall we account for the production of all the great works of antiquity anterior to the æra of that philosopher? By what means did the Egyptians and Babylonians become famous in a knowledge of astronomy and the calculation of eclipses, if ignorant of numbers? Do not even the scripture notations refute the assertion? Can it rationally be supposed that the ancient cities of Babylon, Nineveh, Jerusalem, Memphis and Thebes;—the unequalled palaces of Balbec and Palmyra;* the temples and pyramids of Egypt;—that such stupendous works of art were constructed without the knowledge and aid of numbers and geometry? To entertain an opinion so strange is tantamount to an admission, that, in works of art, symmetry and beauty of execution, can be produced without the pre-existence of elementary principles, or knowledge to form and direct. Such an idea may be classed with the Epicurean notion, of mundane order and beauty arising out of a fortuitous concourse of atoms!

The same writer must surely also have forgotten, that several hundred years anterior to the days of Pythagoras, there was a musical order instituted by King Solomon for the service of the temple: that establishment was com-

* The construction of Balbec and Palmyra have, I am aware, been ascribed to the Romans, but without even a shadow of reason or proof.

posed of two hundred and eighty-eight persons skilled in vocal and instrumental performance, which they *constantly taught*, and in which, as the service required them to be, they were regularly and perpetually exercised. Now this could not have been carried on without the knowledge of *principles*, which combined with practice, and animated besides with a sense of the divine presence, must have given that choir a perfection in the art, I believe, far transcending any thing that Pythagoras, or his superstitious followers could have formed any conception of. Even the poems of Homer sufficiently refute the said assertion: the astonishing *effects* there mentioned, as having been produced by the power of music, could not have been independent of *principles* existing in a knowledge of the art. Mr. Bruce, when in Egypt, copied from a painting in a subterraneous room the figure of an elegantly formed harp, which, was supposed to have been depicted there long anterior to the age of Pythagoras. Now it is affirmed in scripture, that the wisdom of Solomon not only excelled that of the *Egyptians, but also of all the people of the East.* But we may go back to a period of two thousand years before his time; and find that a knowledge of the arts existed amongst the first fathers of mankind. In the fourth chapter of Genesis, amongst other things, it appears, that they then understood the construction of organs and harps. And so far from the world being indebted to the idolatrous Greeks* for the principles of *morals* or of *physics*, the very reverse is the fact: what is there in the writings of any moralist

* Josephus, in his answer to Apion, uses a very short but conclusive argument: "As to the point in competition between the two nations (Jews and Greeks) respecting which of them should have the preference for men of arts and learning; the reader," says he, "has no more to do but to consult our antiquities for his satisfaction."

amongst that people that is not to be found in the laws delivered by Moses, and in the Proverbs and maxims of the Hebrews who wrote subsequently to him? Those laws, in fact, constitute the solid basis upon which all other wise codes are founded. Solomon it is recorded wrote, or delivered, three thousand proverbs; nor was he less skilled in poetry, physics, or a knowledge of nature; having treated of trees and herbs; of beasts, fowls, reptiles and fishes; and he expressly declares, in his book of wisdom, that in astronomy, as well as in other sciences, God himself was his instructor.

Most of the modern Europeans, notwithstanding these testimonials, seem greatly disposed to undervalue the accomplishments of the ancient Palestinians in the useful and elegant arts of civilization: but let us hear the opinion of the great Aristotle, or, at least, that which his disciple Clearchus puts into his mouth, concerning a Jew of a certain class of philosophers. "It would be tedious," says he, "to run through the whole history of the people the Jews, and therefore I shall only give you a taste of this particular person's admirable wisdom; he was a Jew of the lower Syria, of the *race of a sort of philosophers* that the Indians call Calani; and the Syrians call them Jews from the country where they live. Their capital city has a hard name and they call it Jerusalem. He was a person of great hospitality to travellers and strangers; and no less considerable for his discourses and good manners. It was my fortune to be in Asia, with some disciples of mine; and this heavenly man gave us several visits there; to the high satisfaction and improvement of those that understood the blessings of such a conversation." A nation possessing such characters as this certainly could not rank very low in

the scale of civilization. Hecatæus, another Greek writer, also mentions, that amongst a number of persons who followed Ptolemy the son of Lagus, after his reduction of Syria, into Egypt, was "one Hezekiah, a high priest of the Jews and a person of the first quality amongst his countrymen, sixty-six years of age, a wise man and a powerful speaker, and one that understood the world, no man better. We had several meetings and conferences," says he, "with this great man, and others about him, concerning our different customs, practices and opinions, insomuch that he carried us to his habitation and instructed us in the manner of his people's government and discipline, which he shewed us in writing." Under chiefs such as this;—wise, communicative and hospitable; the people of Syria and Phœnicia maintained the elevated rank described by Pliny the Roman naturalist. "A region in times past," says he, "the chief and most renowned upon earth. Jerusalem was not only the most magnificent city of Jewry but also of all the East; and that the nation of the Phœnicians had been highly respected for their knowledge and learning; and in particular for the invention of letters, their knowledge of astronomy, navigation, and martial skill." Here then we have the testimony of accomplished Greek and Roman writers in confirmation of the scripture,—that the Jews were a wise and learned nation. The writings of Josephus confirm all this and much more; but as what he relates of the Hebrew antiquities are for the most part amplifications of facts recorded in the sacred books, I pass them by; though I cannot help expressing, by the way, my surprise, that the world, with evidence before it so complete, should be so extremely reluctant to acknowledge the genuine source whence true philosophy and a know-

ledge of the useful and ornamental arts have flowed; and gratuitously, without the sanction of proof, express their obligations for knowledge to a pagan fabulist, in place of the EVER-SHINING FOUNTAIN OF LIGHT; from which through Adam, Noah, Abraham, Moses, David, and Solomon, appears to have been derived a knowledge of letters, husbandry, shipbuilding, astronomy, laws, morals, architecture, &c. History informs us, that the Hebrews, Phœnicians, Tyrians, and Sidonians, colonized different parts of Europe, Asia, and Africa; founded Thebes in Bœotia, Carthage in Mauritania, and Cadiz in Spain. Thus knowledge was planted with their colonies, and every where the arts of polished society were promoted.

The same learned divine, to whom I recently alluded, as if determined to depreciate Jewish acquirement, has in another place this astonishing assertion. "It is *indeed known* that the *immortality of the soul*, was *not known to the Jews*, but by the commerce which they had with the Assyrians." I should be glad to have information of the kind of authority upon which that is *known*. Supposing the Jews, who worshipped the true God, to be ignorant of that doctrine, how, or by what means, came the Assyrian idolaters to the knowledge of it? The Jews were taught from the beginning, that God gave to man a "living soul." He who accompanied them in a pillar of fire out of Egypt; articulated in thunder from Mount Sinai his divine laws; and who favoured them with the occasional ministration of angels and prophets, —gave them ample proofs that the soul of man was immortal! They had, besides these, other facts in confirmation of it: such as the translation of Enoch, the appearance of Samuel to King Saul, after death; and the glorious ascent of the prophet Elijah. These things

were known and credited by the whole nation, as may be inferred by the manner in which they are noticed many ages afterwards by the son of Sirach. And it was no doubt in the firm belief of a future life, that their wise men and prophets were induced to risk their lives by the publick declaration of unwelcome truths. "In the sight of the unwise, (says Solomon,) they seemed to die; their departure was taken for misery, and their going from us utter destruction; but they are in peace, for though they were punished in the sight of men, yet was their hope full of immortality; and having been a little chastised they shall be greatly rewarded."

Here then are sufficient proofs to show, that the Jews were not ignorant of the immortality of the soul: their knowledge of that important doctrine was founded upon both precept and visible demonstration. The Bible must however, it seems, be attacked on all points by the efforts of different speculators, and its authority called in question whenever it opposes their vain and interested dogmas. "The word of God," say they, "suits itself to the prejudices of weak mortals." Not I believe to confirm them either in their sins or in ignorance. The "prejudices of weak mortals" led our forefathers as enthusiastically to believe in a *plurality of gods*, as the credulity and prejudices of modern Europeans have snared them into a firm belief in a *plurality of worlds*. But the word of God opposes both errors, and, by its transcendant light, both are exposed to condemnation; it is directly contrary to every thing that is false or destructive, whether the subject concerns morals, divine worship, or the creation of the universe.

The Creator formed man with capabilities of receiving a true knowledge of himself and of his works: and accordingly imparted to him, as occasions required, the

pure unadulterated elements of useful and ornamental science. If the Hebrew people were appointed by him to receive, and by their writings, travels, colonizations and captivities, to spread a knowledge of his revelations over the face of the globe; acknowledgments of obligation from the rest of mankind are due to them, so far as they have encountered dangers and been diligent and faithful in the discharge of that benevolent duty. To stem the tide of error has ever been an arduous and perilous, though necessary work; otherwise the corruptions of doctrine and the insidious operations of those who are falsely termed philosophers, would completely bewilder the world; fill it with destructive bigotry; or reduce it to a state of the most dark and savage ignorance. In the ample field of useful knowledge, it is the duty of man, as far as circumstances will permit, diligently to cultivate and freely to impart, without respect of persons, anxiety for public applause, or a sordid propensity for the acquirement of lucre; for, such, if ruling motives, are unworthy of genuine science; and from the minds in which they predominate, but little knowledge that is really useful, or beneficially durable, can proceed. Such were not the springs which, in times past, impelled to action those illustrious characters whom providence sent forth to enlighten the world.

I do not however mean to insinuate, that any man ought to labour without having a reward in view, no such thing; on that point I will not subscribe to the reveries which certain modern philosophers have spun out of their own imaginations concerning disinterestedness. But I consider it discreditable to any one, in the free exercise of his intellectual powers, to confine his views to his own immediate advancement; or to

prostitute the talents, which God has given him, to the ever varying fashions and tastes of the fickle multitude. We labour in the sight of a liberal master, who will in due season award us a proper recompence: but the prize is not for the illiberal and mercenary. If like Atalanta, in the fable, we stop to take up the golden apple, we shall certainly fail in the race: but the most feeble labourer in the field, with generous intentions, may cast in some *seeds* which, under the fostering care of providence, may grow, flourish and, in time, produce fruits useful to posterity.

It has by some been enquired, with apparent surprise; if the subjects I have occasionally attempted to defend were true, and of considerable moment, why they were generally rejected by the learned philosophers and religionists. I answer; that, essential truth is of no party: its form and its attire have hitherto been deemed too simple and too plain: it will as little minister to the sordid pursuits of the mercenary, as it will flatter the vain, or promote the views of the proud and ambitious. Its presence amongst the great multitude of these, has not generally been considered as very captivating;—and therefore few comparatively have entertained the heavenly guest. The learned and religious are divided into numerous sects and parties, and he who does not trim his conduct and principles according to the tenets of some one of them, stands but little chance of being attended to by any.

It was at a period when learning flourished in Greece, that Socrates arose and exerted himself to recal his fellow citizens to habits of primitive simplicity, and to a just estimate of things. It was in the presence of an assembly of accomplished Athenians, before whom he had not only proved his innocence, but also that he was

a benefactor to the human race, that, to the eternal reproach of Greece, the sage, in all the majesty of conscious integrity, thus addressed his accusers and those judges who condemned him; "I am now going to suffer death by your condemnation, and they to undergo disgrace and infamy by the condemnation and judgment of truth!"

When TRUTH and DIVINE WISDOM were manifested in a human form;—when He and his followers appeared in various parts of the Roman empire, it was at a time when the learning of the Augustan age was spread over the wide extent of that dominion. To describe the reception they every where experienced is here unnecessary, because faithfully recorded in the page of history. Sufficient it is to observe, that they were judged and punished as the vilest offenders. Succeeding generations have however dedicated churches to their memories; as the Jews built the tombs of prophets whom their ancestors had murdered!

When I thus take a review of the memorable instances of the persecution of truth in former ages,—in periods the most enlightened by the sciences, and the most polished by the arts; I think I may justly infer, without adverting to the temper and conduct of our own times, that the learned and religious, so called, are not in general the most friendly to the reception of science that is founded upon firm and incorruptible truth; and that public report and public opinion are not always just criterions to form a fair estimate of those characters who are occasionally raised up by Providence for the beneficial purposes of pointing out dangerous errors in order that they may be corrected; and that by so doing the institutions for useful learning may maintain their wholesome influence, and that all the bonds

which hold society together may be strengthened and perpetuated. I cannot therefore be deterred from the performance of an obvious duty by the mistaken constructions of narrow-minded prejudice; nor by the ungenerous imputations of those who are impelled by motives of self interest to support and defend the fashionable though erroneous doctrines which have been promulgated by certain great names, and adopted by their learned followers.

The fatal consequences that have on various memorable occasions been effected by the poisonous breath of calumny, furnish subjects for melancholy reflection to every sensible and honorable mind. Men who are sold to interest, who aspire after temporary fame, or who are fascinated with the idols of modern contrivance, rendered sacred by imposing names, are, probably for wise purposes, permitted, by their false colourings, to disfigure the beautiful form of truth;—perhaps, indeed, that it may afterwards, in the fulness of time, shine forth with a more resplendent lustre, which shall demonstrate to all the glorious majesty of its immortal origin.

# CHAPTER II.

**ADOPTION OF THE NEWTONIAN HYPOTHESIS BY THE ROYAL SOCIETY OF LONDON AND THE HONOR OF THE NATION IDENTIFIED WITH IT;—THOSE WHO REJECT THAT SYSTEM PRONOUNCED, BY ONE OF ITS SUPPORTERS, TO BE THE WORST OF HERETICS;—EXTRAVAGANT PRAISES OF NEWTON BY HIS FOLLOWERS;—THEIR POETICAL EULOGIUM AND CREED COMMENTED ON;—THE COPERNICAN SCHEME NOT ADOPTED BY THE MOST EMINENT PHILOSOPHERS WHO FLOURISHED IN THE SEVENTEENTH CENTURY.**

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LEAVING the preceding introductory observations, I now proceed to notice more particularly the matters already premised;—to offer some comments on the theories of the NEWTONIAN CREATION, and to enquire into the facts upon which the moderns pretend to have grounded unanswerable arguments in support of the gentile belief of a plurality of worlds.

A few persons, to whom I formerly expressed my conviction of the fallacy of the Solar System, though in other respects possessing a tolerable portion of candour, would not tolerate my opposition to *that:* when, however, I came to speak upon the hypotheses upon which it is founded, I generally discovered that they believed by faith in the credit of its fabricators, and not by a conviction which was the effect of an attentive examination of the subject. A diligent enquirer, in

possession of an ingenuous mind, must, I believe, be soon convinced, that instead of known truth, mere hypotheses alone are the bases upon which it rests; and that therefore, no mathematical calculations, however elegant and plausible, can establish the *superstructure* as positively true.

But, as things are, very few seem disposed to listen to any objections raised against a system in the establishment of which Sir Isaac Newton acted so conspicuous a part; and more particularly as a few eminent mathematical calculators, joining with him, had induced the Royal Society to receive it as their CREED. The author of a recent "*Historical Sketch of the Institution and Progress of the Royal Society*," observes that it *adopted* Newton's "System of the Universe as one which was INFALLIBLY TRUE, and which it was for the *honor* of the nation *by all possible means* to illustrate and maintain." Accordingly that subject, he adds, *principally* employed the society for *nearly fifty years!* Most certainly they laboured long and hard to entrench and fortify it; and I believe it remains to this day impregnable against all the assaults of the most formidable theorists. These things considered, the observation of an eminent literary character, a few years ago, to an acquaintance of mine, did not much surprise me; more especially as he was of a sceptical turn. "It would," said he, "be far easier to prove the Bible wrong than to disprove the Newtonian system!" What I have heard others of inferior accomplishments advance to the same effect, or to manifest their zeal in support of that system, it would be superfluous here to repeat. I have however had sufficient opportunity of observing, how easily the few, who acquire the reputation of being learned, can work upon the credulity of the multitude,

even to deluding their senses, provided the thing does not immediately appear to affect their property. That so great a nation as the English should, as the said author asserts, identify its honor with the establishment of a barren mathematical theory, is certainly an extraordinary fact: a theory which, in its leading principles, tends to the disparagement and subversion of the fundamental authorities upon which repose the established religion and laws of the land! I am far from supposing that this entered into the views of its Royal and noble patrons: even the sceptics who laboured in the work, such as Dr. Halley, were far more influenced and occupied with an ardent desire of crying down the vortical system of Descartes than any deep-laid design they had then formed against the authority of the first chapter of Genesis. To explode the French system, was considered an achievement greatly to be desired; and, so far as the national *honor* was concerned in that affair, the triumph was sufficiently complete. The Cartesian doctrine of planetary motion was, notwithstanding, better grounded than that of gravitation, because it admitted, that motion must be continued in a sensible medium. However, in time to come, I hope, that kings and governments will not find their honor and dignity materially identified with the success or credit of any idle mathematical conceits whatsoever; but that they will rather employ their influence and authority to repress and discourage public controversy upon subjects of barren hypotheses; and to recommend the employment of figures for what they seem to have been originally designed,—the business of life;—such as the calculations of merchants; builders; surveyors; practical astronomers and navigators; or any other tangible objects of undoubted utility.

Although some who have written in support of this system have evidently been sensible that it is erroneous; yet, having adopted it, they have felt so tenacious of its credit, that they have wilfully forborne to exhibit its faults to public view; fearing no doubt, that if in case they were to do so, the *infallibility* of its founders would be called in question and that the whole fabrick would thereby be endangered. An elegantly written book, now before me, has this passage. "The attentive examination of other books, to which the writer of this performance has had recourse, has shown him, that even the works of those great men who deserve and possess the highest reputation are not free from *errors* of IMPORTANCE; the present occasion does not require the disagreeable task of pointing them out." It is partly owing to this kind of literary delicacy, that the empire of ignorance expands its dominion and perpetuates its reign; that the roots of the tree of error are deepened; that its baleful branches flourish and overshadow the whole of what is termed civilized society, and that mankind become more and more confirmed in error. It was the manifest duty of the writer of an introduction to natural philosophy to point out the *important* errors of his predecessors;—and thereby to have enabled his inexperienced readers to judge between truth and falsehood.

When indeed it is considered what an immense mass of learned works are supported upon the body, or hang upon the branches of the Newtonian philosophy, it is by no means surprising that bookmakers, booksellers and reviewers, so tenaciously defend its character of infallibility: but, independently of interested motives, implicit faith in the dogmas of their master appears to have been characteristic of both the ancient and modern Pythago-

reans. Amongst the former it was accounted unlawful to express a doubt on any thing which their master said, or even to question him concerning it; hence, whenever his disciples, in disputation, asserted a thing and were questioned, why it was so? they would answer, HE SAID IT. In like manner we occasionally find the disciples of Newton using such assertions as the following, and others equally extravagant; "Newton has dissolved the chaos and separated the light from the darkness; his inimitable work, The Mathematical Principles of Natural Philosophy, contains the TRUE ASTRONOMICAL FAITH, and those who reject its doctrines, are the *worst of heretics.*" Thus they condemn; and thus the empire of their tenets has become as absolute as popery was in the zenith of its power. If any one risk his reputation in an attempt to expose the artifices employed in the delusive contrivance, he evinces, in the judgment of the learned, a temerity equal to that of any man who, a few centuries back, would have dared, openly, to attack opinions touching the pope's infallibility: for, if such an one escapes without more severe imputations, that of insanity is sure to be attached to him. Such was the insinuation of the reviewers in the year 1804, when noticing Mr. Parkes's pamphlet of "Newton refuted." The influence which these literary guides have over the minds of multitudes of even such as from education possess considerable information is really surprising. Soon after I had published some thoughts on this subject in the year 1803, a neighbour of mine in Staffordshire informed me, that he had recommended what I had written to the perusal of the minister of the parish, who observed, that he would *first* see what judgment the reviewers would pass upon

it! As however those censors never noticed it, so neither, I suppose, would the reverend gentleman.

If, unshackled by the mercenary views of some of their employers, and unbiased by an undue attachment to fashionable theories and the placits of the schoolmen, reviewers were to stand up the honest and courageous advocates of TRUTH, they would then powerfully co-operate in setting genius free from its fetters and also promote its advance to the glow of beauty and to the maturity of strength.* But as things seem now to be otherwise, and the multitude are content to be guided by those who "darken counsel by words without knowledge," this tree, so fruitful in pagan error, will, I suppose, for a time continue to grow and flourish. Having been transplanted to the Royal Society; there dressed and pruned; watered by the other learned societies all over Christendom, and defended by a host of admirers, from the great professors in colleges down to the itinerant lecturer and the village schoolmaster; it will continue to expand its poisonous branches until they are completely discovered, exposed to the world, and effectually blasted by the lightning of truth.

Of real practical utility this famous hypothesis, like most other hypotheses, is completely barren. Even Pemberton, the friend of Newton acknowledges, that "if the astronomer should suppose the earth to stand still, he could ascribe such motions to the celestial bodies as should answer all the appearances." Most certainly he could; that is undeniable; and nothing more is necessary. By so considering the earth, every *useful* purpose was answered during thousands of years

* The public ought, I think, to feel obliged to Sir Richard Phillips for the peep he gave them into the secret closets of these gentlemen, when giving his evidence before a jury in the year 1808.

before any practical scheme of a Solar System was ever thought of. But then the old system afforded no field sufficiently wide for the exercise of vain mathematical dexterities; no room for the exhibition of learned fluxional calculations on inconceivable velocities of bodies in imaginary curves; nor a sufficient scope for the fabrication of innumerable worlds. A new system was therefore invented, and for the support of it, new laws of motion and a spurious method of mathematical calculation were invented to puzzle and confound, to fortify and defend the imposition, and give it an appearance of profound and awful importance. The means accordingly answered the end in view, and besides, surrounded the baseless fabrick with a labyrinth of such a perplexing construction, that perhaps not one in a hundred thousand feels any inclination to go through the fatigue of following him through its dark and intricate mazes.

Whether Sir Isaac Newton was fully aware of the baneful tendency of his system upon shallow and unstable minds; or that he felt conscious that its glaring absurdities would sooner or later expose the fable to detection and consequent ridicule, cannot now be discovered to a certainty. It however appears highly probable, that in the latter part of his life, his mind was not quite so easy and satisfied with this favourite offspring of his brain as some of his professed admirers would persuade the world to believe.

We are informed by his particular friend Mr. Conduit, that a little before his death he said, " I do not know what I may appear to the world, but to myself I seem to have been only like a boy playing on the sea shore and diverting myself in now and then finding a smoother pebble, or a prettier shell than ordinary, whilst *the great*

*ocean of truth lay undiscovered before me.*" Never, I believe, did the mind of Newton form a more accurate estimate of any thing, than what this single sentence contains respecting the value of his discoveries; it would really appear from this that he was conscious of the folly and of course the inutility of his elaborate inanities; indeed how could it be otherwise, knowing as he did that his system had not a single truth to repose upon.

A recent publication by the Reverend Mr. Cormouls, (entitled, *Eversion,)* reports, that Newton in the latter part of his life was so uneasy respecting the consequences of his philosophical errors, that he unburthened his mind to young Cotes the mathematician; and was even heard to say, "When I am gone Cotes will undeceive the world of a most remarkable error which it labours under." It is supposed that Cotes stood engaged to conceal it during Newton's life time: for, the latter having by his ingenuity raised himself and several of his disciples to affluence and renown, it would have required something more than common resolution to have retraced his steps to the portico of Euclid,* and there openly to have proclaimed and published to the world, that that geometrician and those who adopted his principles approached the nearest to the characters of true and useful mathematicians, and that he and his followers had not only deceived themselves, but also led the world into a delusive and most dangerous system of opinions. It however so happened that Cotes died a

* There seems reason to suppose, even according to his friend Dr. Pemberton, that Newton in the latter part of his life was sensible of having been carried too far by his aerial mathematics, for says he, "He spoke with *regret* of his *mistake*, at the beginning of his mathematical studies, in applying himself to the works of Descartes and other algebraic writers, before he had considered the elements of Euclid with that attention which so excellent a writer deserves."

few years before his master, and, as probably no other suitable confidant was to be found, the world was left to enjoy the delusion it had in the face of the light so incautiously embraced.

On perusing and hearing praises so extravagant, as those lavished upon Sir Isaac Newton, it is natural to enquire, what are the great benefits derived by the world from his discoveries? One proclaims him an "incomparable man." Another declares that his works have secured to him "an immortality of renown;"—that the fabrick erected by him is "as imperishable as the frame of nature." The monthly reviewers describe him, "the pride of the seventeenth century and the most distinguished of the sons of men;" adding, that he "raised himself a name that must live as long as men exist and which *far surpasses that of princes*."

But in order that the reader may have the creed of these philosophers and the eulogium of their master, both in one point of view, I shall here transcribe them from a document produced by a learned divine at the anniversary dinner of the Philosophical Society of London, on the 5th of October, 1814; and there and then devoutly recited and enthusiastically applauded.

"Nature and all her works lay hid in night,
God said, let Newton be, and all was light!
His daring genius pierc'd the dark profound,
On seraph wing he roam'd creation round.*

* No doubt the writer of this would plead *poetical licence* for all this ridiculous rodomontade. Such however was the rise and progress of idolatry in ancient times. Misplaced fanatical reverence; exaggerated praise, and then adoration. This writer begins by falsely intimating; or rather, by positively declaring; that God raised up Newton to rescue his own works from darkness; (though his own revelations had completely done that in the beginning,) and not satisfied with that, he then imagines him to have

Beyond where sweep the planetary train,
Or round the pole slow wheels the frozen wain:
To those remoter fields of dazzling light,
Scarce reach'd by fancy in her boldest flight;
Where sway'd by gravitation's strong controul *
In flaming CLUSTERS *worlds unnumber'd roll.*
Oh for the tints that in the rainbow glow,
The beams that from Golconda's diamonds flow,—
To form of living light a radiant crown
For HIM *who made its dazzling wonders known;*
And to astonish'd man, immers'd in shade,
The prism's refulgent glories first display'd.†

been invested with the divine power and prerogative of penetrating the dark profound, and *flying on seraph wings through the universe.* David in an elevated metaphorical description of the majesty of DIVINE POWER, says, "He bowed the heavens and came down and darkness was under his feet. *He rode upon a cherub and did fly; yea he did fly upon the wings of the wind.* Psal. xviii. 9.

* Newton I suppose borrowed his idea of the *laws* of gravity from an observation ascribed by, I think, Plutarch to Pythagoras; namely; "In order that the gravity of any planet may become equal to that of any other nearer to the sun it ought to be increased in proportion as the square of its distance exceeds that of the other." A mere mathematical conceit founded on the form and properties of the sphere, as will be noticed further on.

† His doctrine of light and colours he likewise appears to have borrowed from the ancient sophists. "There is nothing," says Sextus Empiricus, "in its own nature yellow, or white, or red; sweet or bitter." Which Newton seems to have adopted in his theory of a colourless creation; by which his admirers say, that he acquired immortal fame; though a few others are of opinion, that his said theory has only verified the judgment of Plato, who, in allusion to the divine arrangement of colours in the rainbow, very justly observed, that "Should any one ever attempt by curious research to account for the admirable mechanism, he will by so doing but manifest how entirely ignorant he is of the difference between divine and human power."

However, it is quite clear, that on the subject of optics, as well as on that of gravitation, the leading principles of his theory were taken from the placits of the ancient Greek philosophers. He

For him who mark'd the comet's bright career;
Who in his balance weigh'd each rolling sphere:*

employed himself in systematizing the inventions of others. Mr. Dutens quotes from Plutarch, Lucretius, &c. the following: "Pythagoras and his disciples after him, entertained sufficiently just conceptions of the formation of colours. They taught *that they resulted solely from the different modifications of reflected light;* or as a modern author, in explaining the sentiments of the Pythagoreans, expresses it, *light reflecting itself with more or less vivacity, forms by that means our different sensations of colour.* Those same philosophers of the Pythagoric school, *in assigning the reason of the difference of colours, ascribe it to a mixture of the elements of light; and divesting the atoms, or small particles of light, of all manner of colour, impute every sensation of that kind to the motions excited in our organs of sight.* The disciples of Plato contributed not a little to the advancement of optics, by the important discovery they made, that light emits itself in straight lines, and that *the angle of incidence is always equal to the angle of reflection.* Plato also seems to have apprehended the Newtonian system of colours, for he calls them *the effect of light transmitted from bodies, the small particles of which were adapted to the organ of sight.* Now is not this precisely the same with what Sir Isaac Newton teaches "That the different sensations of each particular colour are excited in us by the difference of size in those small particles of light which form the several rays; those small particles occasioning different images of colour, as the vibration is more or less lively with which they strike our sense?" The same philosopher, (Plato,) hath gone further; he hath entered into a detail of the composition of colours, and enquired *into the visible effects that must arise from a mixture of the different rays of which light itself is composed.* And what he advances a little farther on, *that it was not in the power of man exactly to determine what the proportion of this mixture should be in certain colours,* sufficiently shows, that he had an idea of this theory, though he judged it almost impossible to unfold it," &c. How far Newton, or those from whom he purloined his principles, have "made its dazzling wonders *known*," real philosophers will hereafter judge and award to them the portion of praise to which they are honestly entitled.

* "Who, (saith God by Isaiah,) hath measured the waters in the hollow of his hand? and meted out heaven with a span, and comprehended the dust of the earth in a measure, and weighed the mountains in scales, and the hills in a balance?" The advocates for the doctrine of gravity answer, Newton is the man who has

Added fresh lustre to the solar rays*
And wide diffus'd the intellectual blaze!
Give me a spot in Nature's wide domain
Of pow'r my mighty engines to sustain,
Give me that spot and by eternal Jove!
The solid earth I'll from its basis move.—
Thus with bold vaunt exclaim'd the Grecian sage
At Syracuse, who brav'd the Roman rage.
Nobler *his praise* whose *daring* ken could pierce
The laws that rule the boundless universe,
Who op'd *new worlds* to our admiring eyes
And all the *latent glories* of the skies.†
On *facts*, not *fiction*, rests his fame,
Who spann'd the arch of heav'ns eternal frame;‡

done it! By his mathematics he has not only measured the waters, air, heat and light, without stirring from his chair; but also, without scales or balance, he could weigh, not only the hills and the mountains, but also the great globe itself, to an ounce. Moreover he could tell with ease the gross weights of Jupiter, Saturn and the rest of the planets, respectively; nay, even the proportionate weight of a cubic inch of any one of them when compared with the same bulk of another. Nor could the flaming matter and dazzling splendour of the sun prevent him from ascertaining it to be two hundred and twenty-seven thousand times heavier than the earth!

* By sending, for the purpose of fuel, an occasional imaginary comet to recruit its decaying fires!

† The admiration of his disciples seems to be in a direct ratio to the daring presumption of the master, and the reason is sufficiently evident,—he powerfully promoted the currency of the favourite notion of Clusters of Worlds! Had he not done so, their praises never would have been so lavishly expended upon him. Newton's idea was, as will be shown hereafter, that *innumerable* worlds were formed by congregations of the sediments of solar light! God's account is, that one world was formed by the energy of his omnipotent word. This was too short and too simple for *Christian* philosophers; though Longinus, a *heathen*, was struck with the divine sublimity of it.

‡ "My right hand," says God by Isaiah, "hath spanned the heavens." These devotees of Newton however assure us that *he* spanned them; and assert with the same breath that his fame rests on *facts* not *fiction!*

Divinely eloquent his precepts roll,
And warm, whilst they convince th' expanding soul.
No *fine-spun* theories his works disgrace;*
Whose axioms roll on truth's eternal base,
Great nature's laws his guide and nature's God,
Sublime the burning galaxy he trod!†
Those laws that to their mighty orbits chain
The circling spheres and bound the raging main;
And while that galaxy its beams shall shed,
His name shall flourish and his glory spread.
SUCH NEWTON WAS, and does the *portrait* fire
No kindred soul like Newton to aspire?
Like him beyond the dark terrene to soar,
And nature in her trackless wilds explore,
Measure the spheres, their shining orbits trace,
And roam, *delighted* through the *wilds* of space."

So the priests who formerly sounded forth the glories of the Babylonian Bell, and that of the Lady of Loretto, by means of wonder-fraught stories and splendid decorations of dress, so effectually contrived to awe and astonish their credulous devotees into an implicit and universal belief of their power, virtues and sanctity, that all suspicion of their delusions seemed to be laid fast

* His theory of "an *inch* of air, such as we breathe, being rarified so as to fill all the planetary regions as far as the orb of Saturn and far beyond;" also "that this *whole globe of earth*, nay all the known bodies in the universe *together* may be compounded of no greater a portion of solid matter than might be reduced into a globe of one inch;"—these, and many others such, are, I think, *spun* tolerably *fine!* But it was a favourite Greek notion which he had borrowed from Democritus, who taught, that it was "possible to make a world out of an atom."—*Stobæus Eclog.*

† "I alone," says Divine Wisdom, "compassed the circuit of heaven, and walked in the bottom of the deep." Is it no *fiction* to transfer the divine prerogatives from the Almighty to Newton? A curious *portrait*, truly!

asleep. For, until the irresistible light of truth, backed by power, put their divinity to the test, and so opened the eyes of the multitude, no one was found bold enough to examine and expose the rotten materials which were dexterously concealed by interested artifice and deception.

It is owing to the excessive adulation of a certain description of men, that an opinion has obtained currency, that the world has been wonderfully obliged and benefited by the Newtonian speculations: for, how could any learned man justly term Sir Isaac "the pride of the seventeenth century—the *most distinguished* of the sons of men," if he was not in reality by his discoveries a most extraordinary benefactor to the human race? How far he was in reality such his books of course will best decide. His disciples, however, will, I am firmly persuaded, be as much puzzled to *prove* his astronomical speculations useful, as they have been puzzled in their fabrication of pretended proofs of the earth's motion, or the frigidity of the solar orb! Absence of proof is however abundantly made up by extraordinary boldness of assertion.

In a very elaborate work of many hundred pages, entitled, "Elements of Mechanical Philosophy," is the following, amongst many other remarkable passages. "Society," says the writer, "never would have derived the benefits which it has received from astronomy without the *labours of the philosophers;* for had not Newton, or some such exalted genius as Newton, *speculated* about the *deflecting* forces, which *regulate* the *motions of the Solar System,* we never should have acquired that exquisite knowledge of the mere phenomena that is *absolutely necessary* for some of the *most important* applications of them *to the arts.* It was *these speculations alone* that have enabled our navigators

to proceed with *boldness* through *untried seas* and in a few years to have almost completed the survey of the globe; and *thus* do we experience the most beneficial *alliance* of *philosophy* and *art.*"

Whilst the credit of philosophers continues to secure this belief, their books of course will continue to be had in request and their imaginary importance will be supported. But I would ask any experienced navigator, of what use "*speculations* on the *deflecting forces*" would be to him in *any sea*, but more particularly an *untried sea?* Would they discover islands, rocks, and shoals? Cook's predecessors, Magalhaens, Tasman, Van Noort, Drake, Dampier, Mendana, and other celebrated navigators, knew nothing of such *speculations;* they, nevertheless, proceeded with admirable "boldness through untried seas" and oceans; discovered New Holland; New Zealand; the Friendly Isles: Mendoza Islands, &c. In short they traversed the great Pacific Ocean, and penetrated I believe farther north than any of their successors have done. I will not suppose that professor Robison intended to impose upon his readers by such an unfounded assertion: I would rather suppose, that he made it without due reflection; or without the discoveries of former navigators occurring to his recollection. If mariners of our own time are more skilful than those of former times, it is owing to others having led the way; and to more extensive experience by the universal encouragements of commerce, but by no means to speculative hypotheses.

If tables of the moon's motion, constructed for finding the longitude, are more perfect than formerly, it is entirely owing to such accurate observations as those made by, and under the directions of Mr. Flamsted and the late Mr. Maskelyne, and not to imaginary

physical theories and pretended corrections, such as those of La Place, La Grange, and La Lambre; the introduction of theoretical results, without doing any real service, has rendered the construction of tables exceedingly complex and tedious.

Therefore to heap extravagant praises upon the reveries of Sir Isaac Newton, is paying no compliment to the understanding of those who are in the habit of doing it. The smoke, however, of their lavished incense may be deemed useful in order to form a cloud over the imposing fabrick of his system, and to cover it from the prying eyes of plain honest men.

That the fluxionists should presumptuously assume the privilege of judging and condemning divine information, and notwithstanding be complimented as modest and profound philosophers, are circumstances certainly not very creditable to the character of Christians for wise discrimination. The learned and acute Bishop Berkley took considerable pains to expose the impious absurdity. If the admirers of the theoretical Newton, the prophane Halley, and the sottish Emerson, would peruse their works with candour, it might probably help to liberate them from the snares of this deceitful philosophy.

Very few, if any, of the truly wise and accomplished philosophers who adorned England in the seventeenth century would countenance or encourage it. Sir Francis Bacon and the Honorable Robert Boyle were possessed of the most comprehensive minds, and of every possible means of information, so as to enable them to draw a just conclusion as to the true system of the world; and they accordingly rejected the Copernican and declared for the Divine. These illustrious scholars were acquainted with the use of telescopes; but they were not

charmed with the idea of world-hunting; they did not waste their time nor sacrifice their talents in perverting mathematics for the promotion of scepticism; but, on the contrary, they conceived and taught, that every view of the philosopher should be directed to the honor of God; to the use and ornament of society: for which noble ends they would have knowledge cultivated and improved to the utmost. "Let no one," says Bacon, upon a weak conceit, or ill-applied moderation, think, or maintain, that man can search too far, or be too well studied in the book of God's WORD, or in the Book of God's works, divinity or philosophy: but rather let men awake themselves and cheerfully endeavour and pursue an endless progress and proficiency in both; only let them BEWARE lest they apply knowledge to SWELLING not to charity; to OSTENTATION not to USE." Bacon affirmed that the theory of the earth's motion was false and that the first chapter of Genesis was true.

Boyle, though skilled in the knowledge of most things within the sphere of human observation, appears to have made all his learning and all his labour subservient to a recommendation of the sacred books and to the service of society; declaring his unqualified belief of the divine history of the creation, and also that the miraculous fact recorded in the tenth chapter of the book of Joshua was literally true. "So far," says he, "is God unwilling that we should pry into his works that by divers dispensations he imposes on us little less than a necessity of studying them. For first he begins the book of scripture with the *description*" (not the *misrepresentation* as the Newtonians will have it,) of the book of nature, of which he not only gives us a general account to inform us that he made the world, since for that end the very first verse in the Bible might have sufficed, but he

vouchsafes us by detail the narrative of each day's proceedings; and in the two first chapters of Genesis is pleased to give nobler hints of natural philosophy than men are yet perhaps aware of." He adds, "God has made some knowledge of his created book both conducive to the *belief*, and necessary to the understanding of his written one."——"God was pleased to consider MAN so much more than *the creatures made for him*, that he made the sun itself at one time to stand still, and at another time to go back, &c."—*Boyle's Second Essay Nat. Phil.*

Both of these celebrated men diligently contemplated the works of God, and were therefore, it may reasonably be presumed, fully as competent to form a true judgment of the system of the world as those Newtonian mechanists and fluxionists who, shut up in their studies, consume their days in applying their master's method, without examining the soundness of his fundamental hypotheses; and brood over his imaginary experiments of cannon balls shot from the tops of mountains;—of hoops and soft balls of clay whirled about spindles; pebbles about millstones, and strings and balls about the finger: all of which were devised to pass off his laws of motion, which both nature and art disown, and therefore contrived only to deceive the credulous and ignorant.

Sir William Temple, in his *Essay upon the ancient and modern learning*, appears to have held no very high opinion of modern improvements in astronomy; "For," says he, "there is nothing new in astronomy to vie with the ancients, unless it be the Copernican system; nor in physic, unless Harvey's circulation of the blood. But whether either of these be modern discoveries, or derived from old fountains, is disputed: nay, it is so *whether*

*they are true or no:* for though *reason may seem* to favour them more than the contrary opinion, yet *sense* can very hardly allow them; and to satisfy mankind *both these must concur.* But even admitting," he adds, "that the discoveries were true, they have made no change in the conclusions" (the useful conclusions) "of astronomy, nor in the practice of physic, and so have been of little use to the world, though perhaps of much honor to the authors." These observations were published, I believe, more than twenty years after the Principia of Newton appeared.

To the foregoing, I may add an observation of that wise and benevolent judge, Sir Matthew Hale. In his book of *A true Origination of Mankind and the Universe,* he says, "I shall not here contend much touching the system of the universe; whether the earth be the centre thereof, or the sun; whether it consist of so many several systems, or vortices; whether every fixed star hath its vortex, and the sun the centre of the planetary vortex, only thus much I shall say, 1. That THIS DIVINE *hypothesis delivered to us by the hand of Moses seems wholly to contradict the supposition of solid orbs, and strongly concludes that the heavenly bodies are moved in liquid æther.* 2. It seems rather to countenance that system of the universe that supposeth *the earth to be the common centre thereof,* than the *imaginary hypotheses* of *Copernicus, Galileus, Kepler,* and *Descartes.* 3. That it utterly contradicts the *hypotheses of Aristotle* and *Ocellus* and the *Pythagoreans touching the eternity of the world, or of the heavens;* and likewise the *fiction of Democritus and Epicurus of the casual coalition of the universe by the motion or interfering of atoms.*" To which last *fiction* Sir Isaac Newton appears to have adhered, and so his followers will continue as long as Greek fiction shall be

preferred before divine information. But I do not quote the opinions of these accomplished men for the purpose of guiding others: my object is to show, that those who from habits of reflection, advantages of education, and extensive experience, were most competent to form a correct judgment, attached little or no value to what is now so generally held up as the most sublime of human inventions, and the most important of human pursuits. But let every one seriously reflect, and then candidly adopt that belief which he finds most consonant to the cool dictates of his own judgment.

## CHAPTER III.

**ENUMERATION OF ASTRONOMICAL SYSTEMS;—NEWTONIAN DOCTRINE OF WORLDS FORMING THEMSELVES OUT OF SOLAR VAPOUR AND SEDIMENTS OF LIGHT;—OF HELL, ACCORDING TO THE BELIEF OF SOME OF NEWTON'S FOLLOWERS, BEING PLACED IN THE SUN, AND THE DESTRUCTION, OR RENOVATION, OF WORLDS BY FALLING INTO IT;—OF THE EARTH BEING FORMED OUT OF THE ATMOSPHERE OF A COMET ACCORDING TO WHISTON;—OF AN EARTH AND A HEAVEN WITH ITS LUMINARIES WITHIN OUR EARTH, ACCORDING TO DR. HALLEY; AND OF PLANETS, ACCORDING TO LA PLACE, FORMING THEMSELVES OUT OF DENSE SOLAR ATMOSPHERES.**

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Astronomers have, under various pretences, imagined and promulgated several Systems of the Universe; of which may be mentioned, firstly, the *first* Pythagorean, said to have been borrowed from the Chaldeans, and afterwards embraced by Aristotle, Ptolemy and Proclus. Secondly, the Platonic, or Porphyrian System. Thirdly, the Egyptian System, adopted by Vitruvius, Macrobius, Capella and some other distinguished authors. Fourthly, the Tychonic; and, fifthly, the Semi-Tychonic, or the System of Ricciolus. But as, in these several schemes, the earth is considered as occupying the centre of the universe, it is of no great consequence to notice here the points on which their inventors appear to have disagreed. I therefore proceed, sixthly, to

notice that which is termed the second Pythagorean system, which is conceived upon a plan nearly the reverse of all the rest. I say the *second* Pythagorean System; for, it appears by the Commentaries of Hierocles on the golden verses of Pythagoras, and is confirmed by Pliny, that he at one time considered the earth to be placed in the centre.

But that philosopher, either not satisfied with the simplicity of the system which he had learned during his travels through the East, or being desirous of flattering the prejudices of his countrymen, who contemplated the sun as their supreme God;* he, in order to gain their applause, or to excite their admiration by novelty, (for Pliny says he was a man of a warm, and lively imagination,) assured them, that the object of their adoration rested in the centre of the universe; and that the planets—the other subordinate deities, which they were taught to believe had emanated from him,—were in motion about him. There were some, it appears, however, amongst the learned men who opposed the novelty, esteeming it prophane; particularly the philosopher Cleanthes who, according to history, was of opinion, that Aristarchus, who had adopted it, ought to have been tried by the Greeks for irreligion. This opposition probably had the effect of giving it currency for a time. But as soon as the mental effervescence, created by the novelty of the doctrine, cooled and subsided, and deliberate reason resumed the judgment seat; the ponderous globe of earth was again, by general agreement, allowed to fill its ancient central situation;

* So Josephus says the Athenians believed. And it is mentioned by Diogenes Laertius, that because poor Anaxagoras maintained an opinion that the sun was a burning plate he was tried for his life for the impiety.

and the sun as before to perform his daily service about it. So this disposition of both bodies appears to have remained until, as we are told by a writer of the seventeenth century, "it was resuscitated from oblivion and the grave by a Cardinal Casanus, and afterwards adopted and taught by Copernicus." It was not supposed by the learned in general, in those days, that Copernicus really believed in the inverted order of things as represented by his scheme. Mr. Blundevil, (who had been tutor in Lord Bacon's family,) in his Cosmography, adverting to this hypothesis, observes; "Some deny that the earth is in the midst of the world, and some affirm that it is moveable, as Copernicus, by way of *supposition* and *not that he thought so indeed.*" Whatever he or his followers really *thought;* or whatever they may pretend respecting the optical proofs which they say they have in favour of the hypothesis; or of its great convenience for calculation; the favourite object they have had in view, and of which they have, in opposition to the first chapter of Genesis, laboured to establish a general belief; is the doctrine of a countless plurality of worlds! To affect which, the fable that Copernicus ineffectually laboured to establish, Newton's fertile imagination vamped up anew, in a shape so plausible and fascinating, that before there was time for sufficient reflection upon it, it had been received and recommended by a considerable number of mathematical logicians of eminence.

With reasons recommended by elegance of language, school method, and curious experiments; all mathematically clothed and magisterially delivered; Newton became elevated above all the theorists in Europe. His genius, says one of his trumpeters, enlarged the boundaries of the universe! That is the subject of their perpetual gratitude! Truly, we must confess, that the

extraordinary liberality of his imaginary creation and distribution of worlds, suns and terrible fiery comets, with all the wonderful things said to be appertaining to them, places our poor EARTH in the back ground and attaches to it a character of, comparatively, insignificant nothingness. This wonderful metamorphosis passed off with great eclat, and was generally adopted as absolute reality and truth, upon the ground work of certain curious experiments made by Newton in his study with strings, balls, glasses, feathers, soap-sud-bubbles and other articles of equal importance, which he dexterously managed to pass off as *proofs* in support of his doctrines concerning the moving forces, and œconomy of the heavenly bodies.

The sentiments of Sir Isaac Newton, concerning the origin and destruction of his imaginary worlds, are certainly very remarkable, and in my opinion quite worthy of the other parts of his elaborate plans. And to do him justice I shall give them exactly in the words of his particular friend Mr. Conduit. "He, Sir Isaac, repeated to me, by way of discourse, *very distinctly*, that the vapours of light emitted by the sun, which had their sediment as water and other matter, had *gathered themselves by degrees into a body*,* and *attracted* more matter

* By the agency, I suppose he meant, of that *forming* and *moving* spirit mentioned in the last passage of the Principia. The Edinburgh professor, in his "Elements of Mechanical Philosophy," seems angry and grieved, that Newton, whom he terms one of the most pious of mankind, should have been set at the head of the atheistical sect; and that they should have established the doctrine of universal fate on his *great* discovery of gravitation. Blameable they certainly have been, and highly so, for blindly adopting his crude notions of *sediments of light forming themselves into worlds.* But then he, as a professor of Christianity, was most reprehensible for promulgating such gross nonsense, with all that oracular authority which caused it to pass upon weak minds for veritable information.

from the planets, and at last made a secondary planet, and then by *gathering* to them and *attracting more matter*, become a *primary planet;* and then by increasing still *became a comet;* which after certain revolutions, by coming nearer and nearer to the sun, had all its volatile parts condensed and became a matter *fit to recruit* and *replenish the sun*, which must waste by the constant heat and light it emitted, *as a faggot would this fire if put into it;* (we were sitting by a wood fire,) and that would probably be the effect of the comet of 1680, sooner or later, for, by the observations made upon it, it appeared to come to the sun with a tail only two or three degrees long, but by the heat it contracted in going so near the sun it seemed to have a tail of thirty or forty degrees when it went from it; that *he would not say* when this comet would drop *into the sun;* it might, have perhaps, five or six revolutions more first, but, *whenever it did*, it would so much *increase the heat of the sun* that *this earth would be burnt and no animals in it could live.*" No wonder that people are so dreadfully alarmed at the appearance of these bodies!—as I had an opportunity of witnessing in the year 1811. Such were the principles of creation and destruction which our great philosopher taught! The people who could receive and believe the account might, in point of intellect, rank with those in ancient times, who forsaking the living God, bowed before the calves of Jeroboam. It was however received with the most profound reverence like every other wonder that was revealed by the same oracle.

A learned theologian of the last century taught that "both this globe and the planets owe their subsistence to the sun, as every one may gather from the information of *his senses*, or *from the writings of natural philoso-*

*phers;* and as they derive their *subsistence* so does it follow by a natural deduction of *reason* that they derive also their *existence* from it; seeing that continual subsistence implies a continuance of first existence and *consequently* that this natural world was created by God through the instrumentality of the sun." This is deemed a regular chain of philosophical reasoning, and believed by great numbers to be conclusive: but I would ask, is not water as necessary to human subsistence as fire? Has it not in the order of creation, according to God's account, a priority of existence? If so, then it would be as reasonable to assert that man derived his existence from water,—that the Egyptians derived their existence from the Nile, because its overflowings are as necessary to their *subsistence* as the animating warmth of the sun; for, were it not for the former the powerful heat of the latter would burn every thing up, and either destroy or drive the inhabitants away to another country. But it seems that the sun is as necessary to these philosophers, in the creations of their fancy, as burning Etna was to a certain Greek deity in the fabrication of his vulcanian wonders. Their imaginations, however, go far beyond those of the Greek fabulists. Jupiter is said to have been furnished by Vulcan with thunder only for the destruction of the giants; but the imaginations of our philosophers furnish the Power of gravity with fiery comets to burn up, or dash into atoms, whole worlds.

The learned and Reverend Tobias Swinden in his "Enquiry into the Nature and Place of Hell," (which book he dedicated to the Bishop of Rochester,) adopted Newton's curious doctrine of worlds falling into the sun! And very elaborately endeavoured to prove, that the sun is the seat of hell; in which wonderful opinion

he was supported by the Rev. William Wall. So that according to the profound conclusions of philosophers and divines, this beautiful and well-furnished globe arose from hell and to hell it will return with an accelerated velocity! The last named gentleman, with astonishing gravity, puts the question, "Whether the body of the earth when burned to a coal by the sun will, like a nutshell let fall into a great flame," (mark the simile!) be tossed out again and carried to a new and better place in the firmament," (but how could it escape the fangs of Newtonian gravity?) "and become a NEW EARTH," (from an *old one* burnt in hell to a *coal!)* "in a new heaven, or sky, and there be the scene of the millennial state, *I forbear* to consider, &c." A very prudent *forbearance,* but why then propose the question? Men who could entertain such notions as these seem to have had minds prepared to believe any thing provided it came from a philosopher.

Though the subject of these pages does not require me to discuss the existence or situation of the place in question, I will just notice the shallow grounds of their reasoning. The Jewish belief certainly was that it existed within the globe of the earth, as appears from a piece written expressly on the subject by Josephus. But Mr. Swinden observes, "If it were an absolute necessity laid on us from revelation to believe the hell to be in the body of the earth, we must then account for it this way, viz. by *spirits* admitting *penetration of dimensions;* there being *no other* way left whereby we can *possibly suppose* the *infinite* number of devils and damned spirits to be contained in it." In the first place the scripture no where leads us to suppose that the number of such is *infinite;* but if *infinite* neither the sun nor any other *finite* space could hold them without,

as he observes, penetration of dimensions; that is, unless more than one were capable of occupying the same space at the same moment. We know something of the history of the world upon which we live, and therefore are able to form an idea of the probable amount of human beings which have, since the creation, been produced upon it. It is said at this time to contain about 800,000,000 of inhabitants; but I will suppose it to contain 1,000,000,000 and the *average* population since the creation and for six thousand years to come, 500,000,000. Now, according to the bills of mortality, about a thirtieth part die annually, namely 16,666,666. This multiplied by twelve thousand years gives about 200,000,000,000, for the total amount of human beings who will have had existence at the end of twelve thousand years from the creation. The question then is, what space would that multitude occupy in, or upon, this globe? I answer, that a space equal to the surface of Great Britain would not only allow them standing room, but also room for each in a reclining posture; for if, as geographers inform us, it contains a surface of ninety-four thousand square miles, the number of square yards will be 293,652,480,000. Therefore if this earth were to exist for millions of years, with a continual re-production of inhabitants, there would be plenty of room for them all, whether embodied or disembodied.

Should it be objected that Newton himself did not publish what Mr. Conduit has reported; I would remark, that the doctrines of some celebrated philosophers of former times; though distinguished sects were founded by them, were not published by themselves; they were nevertheless answerable for their opinions and doctrines, though promulgated by their disciples. It is however

sufficiently manifest from Newton's own writings, that what I have quoted from Mr. Conduit were the real opinions which he himself professed; for in the Thirtieth Question, inserted at the end of his Treatise on Optics, the fourth edition of which he had prepared for the press a short time before his death; he asks, "Are not *gross bodies* and *light* convertible into *one another?*" and further on, "the changing of *bodies into light* and *light into bodies*, is very conformable to the course of nature, which seems *delighted* with *transmutations*." Having suffered his own imagination to create solid, though imperceptible, particles of matter of various sizes and shapes; he then in order to give effect to his own creation,—or rather to the creation of his masters Leucippus, Democritus and Epicurus,—brings in the name of God, who, he supposes, "in the beginning, formed matter, in solid, massy, hard, impenetrable, moving particles, of such sizes and figures, and with such other properties, and in such proportion to space, as most conduced to the end for which he formed them; and that those *primitive particles* being *solids*, are incomparably harder than any porous bodies compounded of them;" (namely, *visible* bodies) "even so hard *as never to break in pieces;* no ordinary power being able to divide *what God himself made* ONE *in the first creation*. While the particles *continue entire*, they may compose bodies of *one and the same nature and texture in all ages:* but *should they wear away*, or *break in pieces:*" (they were just now supposed to be so hard as never to break in pieces,) "the nature of things depending on them *would be changed*. Water and earth, composed of *old worn-out particles*, would not be of the same nature and texture now, with water and earth composed of *entire particles* in the beginning." Here

he talks about a thing being worn out, or breaking in pieces, that was never yet seen or felt. However, as water and earth, for aught we know to the contrary, are still the same as they ever were, we will suppose, that his invisible primordial particles are not broken or worn out; or that they never existed any where except in the capillaments of his own brain. Having however, in imagination, created his primitive particles of matter, consistency obliged him also to employ imaginary "agents in nature able to make the particles of bodies stick together by very strong attractions: and," he adds, "it is the business of experimental philosophy to find them out." Having puzzled the philosophers all his life time, he, in his Thirty-one Questions at the end of his Optics, seems to have set before them work enough to puzzle them to the end of time; and here, amongst many other things, the experimentalists are to find out agents to make particles stick together, which particles cannot be perceived nor even be proved to exist! However, he *supposes* that they actually do exist, and that they "have not only a *vis inertiæ*," (that is, a *force of inactivity,*) "accompanied with such *passive laws* of motion, as naturally result from that *force*," (namely the *force* of *no force,*) "but also, that they are moved by certain active principles, such as is that of gravity and that which causes fermentation and the cohesion of bodies."——But why should the cause of fermentation be brought in amongst these imaginary particles where there is no fermentation to be carried on? He evidently found his solid particles to be unmanageable by the *principles* of *motion* above-mentioned, and therefore, as is customary with the philosophers of this school, when they cannot make parts fit, they bring in some name, or epithet, to assist them

in their creation. "Now," says he, "by the *help* of *these principles, all material things* seem to have been *composed of the hard and solid particles* above-mentioned, variously associated in the first creation by the *counsel* of *an intelligent Agent.* For *it became him who created them to set them in order.*" Other romance writers generally manage matters better, for, they set the beings of their own creation in order themselves. All this is certainly very wonderful! The Marquis de l' Hospital might well ask, if "Mr. Newton eat, drank, and slept like other people?"

Sir Isaac Newton, in the establishment of his SYSTEM OF WONDERS was fortunate in meeting with a company of disciples, who in the stupendous works of imagination not only kept pace with him, but even went far beyond him. The imaginations of the heathens created gods according to their wants: so the imaginations of philosophers create principles of motion, or any other principles, to enable them to solve all sorts of phœnomena.

While Newton's inventive powers created *visible worlds* from *invisible particles,* his friend Dr. Halley created an *invisible world* with its system of luminaries, *under ground.* The mysterious properties of the magnet puzzled him; and he was for some time at a loss for a theory to explain the variations of the magnetic needle; and as he could not discover any visible cause that would account for it; his imagination, after working for some time, set in motion an invisible one; namely, "a loose internal nucleus within the earth: and while pursuing that idea, he conjectured, that the world we live upon may have *another habitable world within,* surrounded by a *system of luminaries,* similar to those which give light *to the upper earth.* He was of opinion, that

the supposition of such a planetary *heaven under ground* would account for the difference between the *specific gravities of the earth* and *the moon.*" It will scarcely be credited, says Mr. Jones, from whose book I have before quoted, "that any author could seriously advance such a wild hypothesis; but mathematical vanity hath its legends, and can be as credulous, upon occasion, as the vanity of superstition." The paper in which Dr. Halley proposed this theory, is printed in a volume entitled Miscellanea Curioso, page 43, &c. That, certainly, was the proper place for such a paper, for it is a great philosophical curiosity; many have, however, been produced from the same school which are equally entitled to a place in the same miscellany. In that school imagination was allowed to have its full play, and the learned Doctor had as great a right to promulgate the theory of *a heaven* being situated *within the earth,* as his coadjutors had to teach that there are *earths in heaven;* or that dark opaque bodies shine like those of a crystalline nature,—that black is white!

Mr. Whiston, another learned disciple of Sir Isaac Newton, seems to have possessed imaginative powers equal to those of his master. He laboured to produce a belief, that the world we live on was formed out of a comet's atmosphere, and that another comet caused the universal deluge. "His whole system," says Mr. Jones, "reads much like a dream. No man in his sober senses would have ventured to reveal it to the world, that the earth we inhabit was made out of the matter of a comet's atmosphere; that on the *first day* of the deluge, a comet passed *just before* the body of the earth; and that *all this* was *reasonable* upon the ground of some *new* and *wonderful discoveries* in astronomy." By whom were those wonderful discoveries made? Was it not by

the master at whose feet Whiston was trained for twenty years? Had not the disciple as great a right to exercise his imagination in the creation of a world out of a comet's tail, as the master had to exercise his in the creations which I have mentioned? The unnatural creations and violent motions of this system appear to have turned the heads of all those whose minds were imbued with its principles. In other respects it appears by the accounts of Mr. Whiston's character drawn up by Bishop Hare and Mr. Collins, that he was a man of great learning and of the most inflexible integrity. His sentiments were open and sincere; and neither the risk of losing a situation, nor any hope of preferment, was ever allowed to restrain him from publishing whatever he deemed to be necessary for the vindication of truth. He lost his Lucasian Professorship in consequence of the opinions he held concerning what is called the Arian heresy: and he gave offence to the heads of the church by his opposition to some parts of the Athanasian creed. When Dr. Clarke wrote to him to suppress a piece, (in which he proved that our Saviour had several brothers and sisters, of whom Joseph was the father and the Virgin Mary the mother,) not on account of its being false, but that the common opinion might go undisturbed; he observed, that "Such motives were of no weight with him, compared with the discovery and propagation of truth." Indeed his whole life showed a firmness and an independence of mind that have been equalled by few. He had even the temerity *to contradict* Sir Isaac Newton* upon some particular point, by

* Mr. Whiston's character of Sir Isaac is as follows. "Sir Isaac was of the most fearful, cautious, and suspicious temper, that I ever knew; and had he been alive, when I wrote against his Chronology, and so thoroughly confuted it, that nobody has ever since vindicated

which he lost his favour and friendship; and in consequence of which, when he was proposed in 1720, by Sir Hans Sloane and Dr. Halley to the Royal Society as a member, he was refused admittance by Sir Isaac Newton the president;—a sufficient warning to all those who knew how tenacious he was of his favourite opinions, and who aspired to a seat in that illustrious society. A similar spirit seems to characterise his intolerant followers.

But the imagination of La Place, "the finisher of the Newtonian System," in marvellous works of creation and destruction, appears if possible, to have far transcended all those that preceded him. He supposes the sun to be surrounded by an atmosphere which formerly extended beyond the boundary of the planetary system; and that in consequence of successive changes which have taken place in the central body, the sun, its atmosphere has at different times become contracted and condensed into rings, or zones: that out of the condensed matter of such rings, or zones, attraction formed, in succession, all the planets, which received the same velocity that the condensed atmosphere happened to have at the time round the sun: for, he is of opinion, that if the planets had been formed independently of those condensed zones, their motions would have been stopped by that condensed atmosphere when passing them in its approach towards the sun; and that they would in consequence have fallen upon, or into, the sun: therefore the planetary bodies, our earth

it, I should not have thought proper to publish my confutation; because I knew his temper so well, that I should have expected it would have killed him: as Dr. Bentley, Bishop Stillingfleet's chaplain, told me, that he believed Mr. Locke's thorough confutation of the Bishop's metaphysicks about the Trinity hastened his end also.

of course included, were formed by attraction in those condensed zones, which by their successive contractions left them revolving in the orbits in which they were respectively formed. From all of which reasoning he concludes that the sun's atmosphere, at present, does not extend to the orbit of the planet Mercury. The obstructions which several comets have met with in passing through this atmosphere, when more extended, he imagines must have destroyed their projectile forces, and so, by leaving them to the power of gravity, they must have been forced back to the sun. He further supposes, in like manner, that the satellites must have been formed from the atmospheres of the primaries; that the rings of Saturn are condensations of its atmosphere, and that they revolve round that planet according to its diurnal motion: of course it is to be inferred, that those rings are destined, in process of time, to increase the number of its satellites. How unfortunate that the world has not seen *one* satellite formed out of them; because that might have been produced as an experimental proof of the truth of his system! In proceeding in the stupendous works of his imagination, he conceives *invisible* suns to exist, at least as numerous as the visible stars; which suns, owing to their immense sizes, (some of which he imagines may exceed by two hundred and fifty times the supposed size of our sun, which would make them about 6,000,000 of miles in diameter!) by the amazing power of attraction in their bodies, will not permit even the rays of light to leave them, so as to reach our eyes, and that consequently they will remain to us for ever in obscurity; *unless* some great change take place in their bodies, such as appeared in the year 1572, in one of the stars which forms the constellation of Cassiopæa. These creations, with many others which

might be extracted from his books, are certainly marvellous;—in every respect worthy of the "finisher of the Newtonian system." If true, they most certainly "scatter the Christian, or rather Jewish, system, like feathers in the air." Had Newton lived to see these *improvements* on his own creation of wonders, they could not have failed to have thrown him into an ecstasy of delight: for, I verily believe, that it is scarcely possible to stretch the imaginative powers much farther than they have been carried in La Place's system of the world. His self-complacency, on reviewing his work, breaks out in these words;—"Contemplated as one grand whole, astronomy is the most beautiful monument of the human mind; the noblest record of its intelligence." Like that of every other writer who despises the wisdom and the experience of the ancients, the style of this writer is flippant and inflated. He magnifies the monument of his own creation above all the monuments of the ancient sages, in religion, morals, and legislation;—"above all that is called God!" His eulogium, however, would, I am of opinion have been more correct had it stood thus. "Contemplated as one delusive whole, my system of the world is one of the most impious monuments of the human mind; one of the most insidious records of its daring presumption." He proceeds; "seduced by *the illusions of the senses*, and of *self-love*, man considered himself, for *a long time*, as the *centre of the motions of the celestial bodies*, and *his pride* was *justly punished* by the *vain terrors* they inspired." No, no;—God did not give us our *senses* to *seduce* and *deceive*, but to inform our understandings; and our understandings, aided by our senses, will, it is hoped, by and by enable us to penetrate and clearly expose the impious designs of philosophers. Was it pride then in man to

believe what God and his senses have informed him? Is it not pride and presumption too, to attempt to draw man away from these evidences?—As to vain terrors, I shall hereafter show that God himself warned man against them, and I shall also show that the superstitious followers of Newton have increased them a hundred fold. He then goes on, "The *labour of many ages* has at length *withdrawn the veil* which covered the system." That is to say, the labours of a few speculative sophists, during the last two hundred years, have withdrawn the veil that should for ever have consigned the heathenish fable of Pythagoras to oblivion. Again, "Man appears upon *a small planet, almost imperceptible* in the vast extent of the *Solar System, itself,* only an *insensible point in the immensity of space.*" So then *the earth, with man upon it,* is *almost imperceptible;* while the *whole system* is *an insensible point.*—"The *sublime results* to which *this discovery* has led, may *console him* for the limited place assigned him in the universe." For my part, I cannot derive the least consolation from the *sublime discovery;* I rather console myself in the hope, that the imposition will, before long, be fully exposed and rejected by every rational mind. "Let *us* carefully preserve, and even augment the number of these *sublime discoveries,* which form the *delight* of *thinking beings.*" I have already given some proofs of the *sublimity* of these *discoveries,* and shall, by and by, give a few more, and then leave them to be reflected on by those *thinking beings* whose minds are peculiarly susceptible of the *delightful* entertainment. "They have rendered important services to navigation and astronomy: but their GREAT *benefit* has been *the having dissipated the alarms occasioned by extraordinary celestial phenomena,* and *destroyed* the *errors* springing

from *the ignorance* of our *true relation* with *nature: errors* so much the more *fatal*, as *social order* can only rest on the bases of *those relations*. TRUTH, JUSTICE; these are its immutable laws." This is a dark passage; and I agree with professor Robison, that it contains "more than meets the ear;" but what *is* this *great benefit* that these philosophers have imparted to mankind? Do their efforts induce a belief, that the operations of the elements of matter, are left to *their* imaginary physical and mechanical powers, and to chance? Are we no longer to believe, that He who formed the world does not superintend its movements; that He no longer sends His signs; nor convulses the elements; that desolating earthquakes and storms are not under His direction; and in short, that He does not manifest Himself in any way to make mankind stand in awe of His almighty power? If such be not the meaning of this dark oracle, I cannot conceive what it is. As to such a belief inspiring *terror*, I am well persuaded, both from experience and observation, that those who really hold it, are infinitely less under the dominion of fear than those who reject it. But these *sublime discoveries*, he says, have destroyed the "errors springing from *the ignorance* of our *true relation* with *nature: errors* so much the more *fatal*, as *social order* can *only rest* on the *bases* of *these relations*." There he has left us again to feel our way in the dark. How is the knowledge of these *sublime discoveries* to influence or regulate *social order;* or how does an ignorance of them produce *fatal errors?* Supposing that all the world believed the earth, when compared with the other parts of the universe, to be an *insensible point;* and, that this insensible point was formed by attraction out of a solar atmosphere: what, in the name of wonder, has this to do with *social order?* But if he

mean, that his creation, ought to supplant the scriptural account of creation; his laws of motion, the true order of nature; and his *dictum*, the laws of God: in that view I know what to think concerning his dark muttering about *fatal errors*. *Truth* and *Justice* he says are its *immutable laws*. The laws of what? If he mean, that truth and justice ought to form the bases of the laws of social order, all must assent to so evident a truism. He then abruptly concludes with this passage, "Far from *us* be the *dangerous maxim*, that it is sometimes useful to *mislead*, to *deceive*, and enslave mankind *to insure their happiness*. Cruel experience has at all times proved, that with impunity *these sacred laws* can never be infringed." So ends what professor Robison termed, the *ungraceful parody* upon the concluding reflections of his *illustrious master*. Tyrants and selfish individuals may have adopted such a Machiavelian maxim, for the purpose of advancing their own private views, or for the accomplishment of some oppressive scheme; but never for the purpose of "ensuring the happiness of mankind." He has left us as much in the dark concerning his *sacred laws*—as to where they are to be found,—as he has concerning his obscure suns. Solomon, who had learned astronomy from a greater master than Newton, though a king himself, has not left us to grope our way on that subject: he clearly points to those LAWS which are TRULY SACRED; which contain the bases of the only practical system of equality; which equally protect governors and the governed in their just rights; and which award the same punishments to all for violation of them. He well knew that those laws, if duly administered, would secure the prosperity of both kings and people; and as La Place seems to point to governments, I will quote the following passage from Solomon's

admirable book in which he treats on the duty of kings. "Hear therefore, O ye kings, and understand; learn, ye that be judges of the ends of the earth. Give ear, you that rule the people, and glory in the multitude of nations. For power is given you of the Lord, and sovereignty from the highest, who shall try your works, and search out your counsels. Because being ministers of His kingdom, ye have not judged aright, nor *kept the* LAW, nor walked after the counsel of God. Horribly and speedily shall he come upon you; for a sharp judgment shall be to them that be in high places.—If your delight be then in thrones and sceptres, O ye kings of the people, honor wisdom that ye may reign for evermore."—*Wisdom*, chap. vi.

# CHAPTER IV.

**ON THE NEWTONIAN THEORY OF GRAVITY;—ITS APPLICATION TO ACCOUNT FOR THE PLANETARY MOTIONS AND TO WEIGH THE SUN AND PLANETS;—TO EXPLAIN THE EBBING AND FLOWING OF THE TIDES;—TO REMEDY THE DECAYS OF THE UNIVERSE, BY THE OCCASIONAL DESTRUCTION OF OLD SUNS, AND THE FORMATION OF THEM INTO NEW ONES IN THE HERSCHELLIAN LABORATORIES OF THE UNIVERSE!**

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A SYSTEM which has been founded in error, if continued, must necessarily be supported on false principles of reasoning. Therefore philosophers having imagined that their worlds are formed of innumerable emanations from innumerable suns, they have further imagined what they term *laws of motion*, which they say are absolutely necessary to uphold and sustain them in their several courses. And, in order that the reveries of their imaginations may assume the substantial character of realities, they, by an unpardonable prostitution of mathematics, make a great and mysterious parade of figures and symbols; and so impose upon the world phantoms of the brain for demonstrations of essential truth.*

* I am not singular in this opinion, of the occasional misapplication of mathematics. Mr. O'Gallagher in his "Essay on the Investigation of the First Principles of Nature," vol. 1, page 95, makes these observations. "Neither are mathematical calculations, however ingenious, to be looked upon as a confirmation of a physical system, or as responsible proofs of the actual being of the agents supposed;

They begin by *supposing* a bullet to be shot from the top of a high mountain; and they tell us, that if it were not prevented by the resistance of the air and the attraction of the earth, it would fly onward in a straight line to all eternity!* Having sufficiently supposed *that*, they then proceed, upon an idea of Plato and Galileo, further to suppose, that their solar worlds were similarly projected and deflected in spaces where no air obstructs; and after having brooded over the astonishing supposition until they believe, or affect to believe, it to be a reality; wrapt up in wonder they exclaim, "what a PRODIGIOUS attractive power must the sun then have to draw all the planets and satellites of the system towards him; and what an AMAZING POWER must it have required to put all these planets and moons in such rapid motions at first! AMAZING indeed to us because *impossible to be effected by the strength of all the living creatures in an*

because mathematics only compute and ascertain the ratio and proportion of the forces supposed; but never indicate the nature or cause of those forces; *it being very easy to adjust ratios on false principles.*"

* Newton's account of this *imaginary experiment* is as follows: "If a *leaden ball*, projected *from the top of a mountain by the force of gunpowder* with a given velocity, and in a direction parallel to the horizon, is carried in a curve line to the distance of two miles before it falls to the ground; the same *if the resistance of the air was took away*, with a double, or decuple velocity, would fly double or ten times as far. And *by increasing the velocity*, we may *at pleasure increase the distance* to which it might be projected, and diminish the curvature of the line, which it might describe, till at last it should fall at the distance of ten, thirty, or ninety degrees, or even *might go quite round the whole earth before it falls*; or lastly, so that it might *never fall to the earth*, but go forward into the celestial spaces, and proceed in its motion *in infinitum*." Thus Newton begins to set his worlds in motion! he increases the *velocity* and *distance* of his leaden ball, as he says, *at pleasure*, until at length he sends it *quite round the globe!* and this he effected with the same facility with which he created his worlds out of the sediments of solar light. He had only to *imagine it* and *the thing was done!*

*unlimited number of worlds*, but no way hard for the Almighty whose planetarium takes in the whole universe. That the projectile force was first given by the Deity is evident."

True, O great philosophers! Not a million of Herculeses assisted by all the levers and all the powers of your mechanical system, could have set the heavens in motion;—that is quite certain; we needed not the authority of a Newtonian to assure us of that. But why not be consistent? If worlds, according to the principles of your master Epicurus,* *form themselves* out of atoms, or out of certain sediments of vapour and light, by gravitation; why not *set themselves in motion*—why bring in the Almighty's name? Your imaginations raise up extraordinary phantoms in abundance: and then, to secure your followers in the spell of your own incantations, you cover and consecrate the impious folly of your proceedings, by bringing forward the Divine Name to recommend and give currency to your fancies. You first imagine a thing; then consider it a reality—and finally represent it as the work of God! Such folly may justly be compared with that which, as Solomon observed, "*ascribed unto stones and stocks* the INCOMMUNICABLE NAME!" But the atheistical La Place was more consistent.

Attractive and projectile forces, it appears, were imagined by certain Greek and Roman writers. These notions were intimated by the poet Lucretius, and, the combination of both, by Plutarch, who compared the forces that were supposed to give motion to, and retain the moon in,

*Mr. Good says, "The Epicurism of Gassendi was embraced by the most eminent modern philosophers, and at last appears to have obtained *an eternal triumph* from its application by Newton and Huygens to the department of natural philosophy!"

her orbit, to the experiment of a ball fastened to a string and whirled by a circular motion about the finger. This was adopted by Newton* to illustrate what he meant by

* But he had not the candour to acknowledge the source whence he drew the principles of his system. "Plutarch" says Mr. Dutens, "who knew almost all the shining truths of astronomy, took notice also of the reciprocal energy, which causes the planets to gravitate towards one another; and in explaining what it was that made bodies tend towards the earth, he attributes it *to a reciprocal attraction, whereby all terrestrial bodies have this tendency, and which collects into one the parts constituting the sun and moon, and retains them in their spheres.* He afterwards applies these particular phenomena to others more general; *and from what happens in our globe, deduces, according to the same principle, whatever must thence happen respectively in each celestial body;* and then considers them in their relative connexions one towards another. He illustrates this general relationship and connexion, *by instancing what happens to our moon in its revolution round the earth, comparing it to a stone in a sling, which is impressed by two powers at once;* that of projection, which would carry it away, were it not retained by the embrace of the sling; which like the central force, keeps it from wandering, whilst the combination of the two moves it in a circle." In another passage, quoted from Gregory by Mr. Dutens;—"a musical string, says Pythagoras, yields the same tone with any other of twice its length, because the tension of the latter, or the force whereby it is extended, is quadruple to that of the former; *and the gravity of one planet, is quadruple to that of any other, which is at double the distance.* In general, to bring a musical string into unison with one of the same kind, shorter than itself, its tension ought to be increased in proportion as the square of its length exceeds that of the other; and *that the gravity of any planet may become equal to that of any other nearer the sun, it ought to be increased in proportion as the square of its distance exceeds that of the other.*" Here are the Pythagorean foundations of their system. What a facetious application of the stone and sling, and the musical string, to the mighty motions of the universe; what a farcical union of the ridiculous and sublime! Certainly they were not the first, nor the last, experiments that have been played off upon human credulity. But that Christian philosophers, who, it is to be presumed, must have read the first chapter of Genesis, should have gravely taught these things, as important truths; and that Christian bishops should still countenance the delusion in the universities, is certainly wonderful: and the record cannot fail, when read by our posterity, to excite feelings of the most lively astonishment.

centripetal and centrifugal forces. The motion of the finger, which communicates velocity to the ball, is compared to the power which they imagine drives the planets onward in their courses, or the centrifugal force; the string represents the centripetal force, or the power of attraction in the sun, whereby the planets are bridled into a circular motion, and prevented from flying off in straight lines which would be tangents to their orbits. One might reasonably suppose, that a little sober reflection upon the immensity of creation, and the admirable regularity of the celestial motions, would have prevented even an uninstructed savage from taking up a comparison so excessively childish and ridiculous; *such* however *might* err, not knowing the power of God: but, that a christian philosopher, (after perusing the revealed account of creation, and the magnificent descriptions of the power of the Creator, which are contained in the same book,) should have founded his imaginary system of universal motion upon the silly conceit, is certainly an amazing circumstance! Yet such is the fact. It is asserted by his friend Dr. Pemberton and his own works verify the account.* It is upon this base that philoso-

* "A stone," says Newton, "whirled about in a sling, endeavours to recede from the hand that turns it; and by that endeavour, distends the sling, and that with so much the greater force, as it is revolved with the greater velocity, and as soon as ever it is let go, flies away." Certainly it does: I once, in particular, when I was a boy, to my sorrow, had occasion to remark it; a stone from my own sling, by accident, nearly blinded an eye of one of my play-fellows. But let us see how the experiment has blinded the eyes of Newton's disciples. "That force which opposes itself to this endeavour, and by which *the sling* perpetually *draws back the stone towards the hand*, and *retains* it in *its orbit*, because it is directed to the hand as the centre of the orbit, *I call the centripetal force.* And the *same thing* is to *be understood* of *all bodies, revolved in any orbits.* They all *endeavour* to recede from the centre of their orbits; and were it not for the opposition of a contrary force which restrains them to, and

phers have founded a system of ratiocination subversive of a belief in the necessity of the immediate and continual superintendance of the Creator over his magnificent works. For, what else do they mean when they assert, that "Phœnomena are wanting* to determine whether attraction depends upon the immediate fiat of the Deity,—or on other intervening causes,—the latter is most probable?" And, that "the mere laws of gravity are sufficient to keep the system going when once put in motion." It is indeed asserted by this class of calculators, that the power of gravity is absolutely necessary to preserve the universe from ruin. The celebrated Dr. Halley declares, that "the globes of the sun and planets *cannot otherwise* be destroyed, than by taking from them *this* POWER of keeping their parts united." Dr. Derham, with fanatical enthusiasm, exclaims, "What a *noble contrivance* this of gravity is for keeping the several globes of the universe from shattering to pieces, as they evidently must do in a little time by their swift rotation round their axes. The terraqueous globe particularly, which circumvolves at the rate of above one thousand miles an hour, would, by the centrifugal force of that motion, be soon dissipated and spirtled into

*detains them in their orbits*, which I therefore call centripetal, would *fly off* in right lines, with an uniform motion." This *experiment* was worthy of Pythagoras, and equally so of his disciple Newton: I imagine I see these delighted philosophers in their studies, whirling the sling about their fingers! But the sublime application of it to the planetary motions,—was truly marvellous!

"Divinely eloquent his *precepts* roll,
And *warm* while *they convince the soul.*"

* Not entirely so. He who heaped up the waters of the Red Sea; caused iron to swim; Peter to walk on the surface of the sea, and suspends the thick clouds; has sufficiently proved that attraction depends upon *His* fiat.

the circumambient space, was it not for this *noble contrivance!*"—"By what means," (demands another devotee,) "are these vast bodies suspended in the immensity of space? What secret power retains them in their orbits and enables them to circulate with so much regularity and harmony? Gravity and attraction is the powerful agent, the universal principle of this equilibrium and of these motions."

Such, we are assured, are thy mighty works, O Gravity! The organs of thy mysteries declare, that thou gatherest the atoms; formest them into worlds; suspendest those worlds at rest, or whirlest them in rapid motion. Thou acceleratest and retardest them in their courses. Thy power goes forth through illimitable space; and wherever matter is, there thy mighty influence is felt. As by the presence of thy power all exist; so, by the absence of it, all shall perish; shall be burned or dashed in pieces by thy cometary missionaries, or finished by augmenting the solar fire!

This curious *system* of gravity; this *noble contrivance*, as they term it, is imposed upon the world under an assurance, that it is grounded upon infallible experiments and positive mathematical truths. It is thus laid down by Dr. Halley.

"That the spaces described by the fall of a body are as the squares of the times from the beginning of the fall.

"That all bodies on, or near the surface of the earth, in their fall, describe sixteen english feet, one inch, in the first second of time, and increase by a certain mathematical ratio.

"This power of gravity *increases* as you *descend* and decreases as you *ascend* from the centre, and that in proportion to the squares of the distances therefrom,

reciprocally, so as at a double distance to have but a quarter of the force: This property is the principle upon which Mr. Newton has made out all the phenomena of the celestial motions so easy and naturally, that its truth is *past dispute.*"

Such a conclusion, drawn from such premises, was quite worthy of the man who declared christianity to be an imposition. *Past dispute!* Where is their evidence that falling bodies are accelerated according to the squares of the times; or that the force of gravity increases as the squares of the distances? It is a mere mathematical figment, and, as such, can only be designed to entrap the understanding of the lazy and unwary. It is assuming the mathematical idea of Pythagoras as a certain truth; though it is evidently a mere inference deduced from the geometrical proposition, that *the surfaces of spheres are as the squares of their radiuses.* We are, however, assured that Mr. Huygens, the mathematician, *demonstrated,** by the vibrations of a pendulum, that "all bodies on, or near the surface of the earth, in their fall, descend so as that at the end of the first second of time they have described sixteen feet, one inch, and acquired a velocity of thirty-two feet." I have examined the rule from which he makes this deduction, but I confess I am not able to discover any just comparison between the motion of a *vibrating pendulous body,* and a body *detached* in the act of falling to the earth: the respective motions are so completely distinct, that I am well satisfied no geometrical reasoning can ascertain the velocity of the one from the motion of the other. But the theory *supposes* what is *impossible;* namely, that these experiments be performed in an *unresisting*

* This word, though very properly applied by Euclid, is grossly prostituted by modern philosophers.

*medium*, such as Newton means by what he terms, the ætherial regions, which have never been proved to have an existence except in the heads of philosophers. It is a question that cannot be decided in a space so confined as the receiver of an air-pump, even if it could be completely exhausted of the air, which is impossible. Mathematicians, however, arrogate to themselves a right to judge and condemn the senses whenever they bear witness to the absurdity of their dogmas. It is their province, it seems, to tell us whether we are correct or not, in supposing we see a body in motion, or at rest. So we are likewise told by a great German professor, that it "*peculiarly* belongs to *chemistry*, to *determine* whether the sun be actually a *burning body*." I remember about forty years ago, that its heat, through a hole in my shirt, raised a blister upon my shoulder.

The Divine Wisdom, (according to the son of Sirac,) ordained in the beginning, that "all things that are of the earth shall return to the earth again, and that which is of the water shall return into the sea:" not according to mathematical rules, but to that Divine appointment, which at the same period also gave circulation to the waters of the mighty ocean, and a perpetual motion to the magnificent system of the heavens. Weak in understanding, and presumptuous in disposition, must that man be who pretends, by the miserable experiments of his air-pump and his pendulum, to estimate the forces of Divine creation! It is a sad misapplication of Geometry.

The operation of that which gives weight to bodies, is evidently limited to the surface of the earth, or within a short distance of it. An illiterate miner once informed me, that it was commonly observed by the men with whom he laboured, that they could lift a greater

weight in the works below than upon the surface of the ground above. The same remark I find in Lord Bacon's Natural History. "It is," says he, "affirmed constantly by many, as an *usual experiment*, that a lump of ore at the bottom of a mine will be tumbled and stirred by two men's strength, which if you bring it to the top of the earth will require six men's strength at the least to stir it; it is a noble instance and is fit to be tried to the full; for it is very probable that the motion of gravity worketh weakly, both *far from the earth*, and also *within the earth*,—the *former* because the apetite of union of dense bodies with the earth in respect of the distance is more dull,—the *latter* because the body hath in part attained *its nature* when it is some depth in the earth. For as for the moving to a *point* or *place*, which was the opinion of the ancients, *it is a mere vanity*." The facility of moving heavy bodies in mines was likewise noticed by the ancients in the pits whence they drew the sal-ammoniac in Egypt; but they erroneously supposed it to be owing to the buoyancy of subterraneous vapours. These accounts alone, if founded in fact, are I think decisive against the *theory* of gravity; for, according to that hypothesis, the difference of a few hundred, or of even a few thousand, yards of *ascent*, or *descent*, could produce no *sensible* alteration in the weights of bodies.

It is only by an examination of the elementary dogmas of this theory, that the mind can be enabled to form a due estimate of the sophistical fabrick which these philosophers have reared. For, as a professedly experimental and mathematical system, the reasoning powers of the understanding, from a due consideration of its component parts, should trace the connexion by a just analogy; and so by rising to a general contemplation of

it, we may pronounce with certainty, that its *foundation* is without substance; its *parts* destitute of symmetry; and, considered as a *whole*, that it is, in reality, useless in practice.

With regard to the affections of attraction in the celestial bodies, they assert, that "All bodies are mutually heavy, or gravitate mutually towards each other; and this gravity is proportionate to the quantity of matter; and at unequal distances it is inversely as the square of the distance, and *so* the sun and planets mutually gravitate towards each other." To *prove* this property in matter; action and re-action; they hold, that "action and re-action are always *equal* and in *contrary directions;* if a stone *be pressed by the finger*, the *finger* is *equally pressed by the stone.* If a *horse draws a stone* the *stone draws* * *the horse equally backward;* for" (mark the *proof!*) "the rope is *equally stretched towards both!!!*" This is Newtonian reasoning! The horse draws the stone with a *visible rope;* ergo, the sun draws the planet, and the planet the sun, *without any visible bond of connexion.* But if the action and re-action of the planets be *equal* and in *contrary* directions, one of course neutralizes the other, and both are therefore useless and of no effect. This is their celebrated third law of motion: but in laying it down, they, by an unaccountable mistake, have omitted to draw a distinction between the *inert* matter of the stone and the principle of *animal life* which actuates

* This is the *vis inertiæ* of Newton: that is to say, the *force of inertion;* the *force of inaction;* or, the *force of no force!* what a contradiction in the very terms;—what an absurdity! Is there any *force* unconnected with spirit? If any one says, yes; let him demonstrate it. Newton was undoubtedly hard pressed in the fabrication of this part of his system, when like a dexterous juggler, he played off this *learned inanity*, to amuse and draw off the attention of his followers from one of the weakest of his impositions upon their understandings.

the horse.* Suppose a man awake, lays hold of another man asleep and drags him about a room, the latter, according to the Newtonian reasoning, pulls equally with the former. I should reason thus: (though less philosophically,) the inanimate stone, suppose a statue, and the sleeping man are both passive; they do not draw at all; but awake the man, or, if you can, put Promethean fire into the statue, and then both will be capable of pulling in contrary directions.

The Newtonians teach, that, the primary and secondary planets and comets, each acts upon all the rest and upon the sun itself; disturbing one another in their respective orbits; accelerating and retarding each other's motions according to their relative situations; by the same means, in a similar way, the planes of their respective orbits are changed, as well as their periodic times. What a curious piece of machinery is this for the consideration of a sober understanding! Oh, say they, "the inequalities and disorders produced in the system by these perturbations are for the most part corrected in a single revolution." By what occult corrector I pray? Whirling a ball round the finger, or their other experiment of tying a pebble to a millstone, is, in my view, very little to the purpose; such however are their *experimental* proofs of the matter.

This doctrine of mutual attraction, had it any real existence, would be utterly subversive of the system; suppose, for example, Jupiter and Saturn to be posited

*Sir Isaac Newton concludes the second Corollary of his first book of the Principia upon what he terms, the composition and resolution of forces, with these words; "from hence are easily deduced, the forces of machines, which are compounded of wheels, pullies, levers, cords and weights ascending directly or obliquely, and other mechanical powers; as *also* the *forces*, of the *tendons* to move the bones of animals!" No distinction between the *force of spirit* and his *mechanical forces!*

in the same point of the heaven; I mean with respect to their heliocentric longitude; and that Jupiter, by the powerful attractive force ascribed to Saturn, is disturbed and drawn out of the orbit which he would otherwise describe, according to the doctrine of centripetal forces; how in such case would Jupiter regain his proper course? For, if the action of Saturn could attract him a single mile, that action would then be *increased*, and would *continue to increase*, according to the doctrine of philosophers, in the reciprocal duplicate proportion, while at the same time the power which should have retained Jupiter in his orbit *decreases* in the same proportion. If, I say, such attractions and affections really exist, the consequences would inevitably be as I have stated; but if no such effects have ever been perceived, then it proves, that the doctrine of action and re-action has no real existence, and that therefore it is of no use but to write about, in order to swell the sizes of books and to increase the number of them. Philosophers nevertheless persevere in teaching, that by mutual salutations and affections the planets neither move in regular circles nor ellipses, but in a kind of zig-zag curves which are always concave towards the central body.

The same system teaches, that the sun is not absolutely the centre of the planetary system, but that there is a point about 4 or 500,000 miles from the sun's centre, that is to say *in* or *near* his *surface*, (these gentlemen are exceedingly nice in their calculations,) which is the common centre of gravity of the sun and planets; about which they all perform their revolutions. This removal of the sun from the centre is said to be effected by the third law of motion, and was intended by Sir Isaac Newton to correct, or explain, certain inequalities which he *imagined* (for he never observed them,) to take place

in the planetary motions. The objections to this dogma are even stronger than those I have just stated respecting the mutual attractions of Jupiter and Saturn: For, the planes of all the planetary and cometary orbits differ in position: the motion of their nodes respectively; their distances, magnitudes and periodic times are likewise all different from each other; and consequently these bodies would act upon the sun in a variety of contrary directions, which would inevitably prevent a regularity in his motion about the common centre of gravity and destroy all harmony in the system. Besides, if their mutual gravities were sufficiently powerful to move the sun 500,000 miles from the centre of the system, the force would then be greatly increased; (say in the reciprocal duplicate proportion,) and what security has Sir Isaac's system provided in such case against an accelerated approach towards each other; particularly if *all the planets* should happen to be *in* or *near* the same degree of heliocentric longitude? What a wild incoherent scheme it is. Here are a number of immense globes of matter said to be powerfully attracting each other—one of which is declared to be 550 times greater than all the worlds which revolve about it; yet, wonderful to tell, they never approach to a union, though they are said to move in spaces totally void of any obstacle to prevent their approach. But, what do I say? I am perhaps losing sight of the matter, that is, of their experiment. While two men, placed at each *end* of a rope, pull in *opposite directions*, their *joint action*, though one of them may be moved from his position, will inevitably prevent them from coming together: so that we are assured, from this *experiment*, that the universe is tolerably safe!

But candour requires that I should here give a specimen of their own reasoning upon the doctrine of

gravitation and projection, as laid down by an admired writer.

"That the sun, and not the earth, is the centre of our Solar System, may be *demonstrated beyond a possibility of doubt*, from *considering* the forces of *gravitation* and *projection*, by which all the celestial bodies are *retained in their orbits*."

These philosophers *consider* a thing as they would have it, and call it *demonstration*. Certainly a string fastened to a ball retains it in its circular motion about the finger; but before they professed to *demonstrate*, that the planets were *similarly retained* in their orbits, they should first have *demonstrated* the existence of a *strict analogy* between their *experiment* and the objects intended to be illustrated by it;—that however they have not done. Perhaps they considered the similarity too obvious to need a demonstration!

"For if the sun moves about the earth, the earth's attractive power *must draw the sun towards it* from the line of projection, so as to bend its motion into a curve; but the *sun* being at least 227,000 *times as heavy* as the *earth*, by being so much weightier as its quantity of matter is greater, it must move 227,000 times as slowly towards the earth as the earth does towards the sun, and *consequently* the earth would fall in a short time to the sun, if it had not a strong projectile motion to *carry it off!* The earth *therefore*, as well as every other planet in the system, *must* have a rectilineal impulse *to prevent its falling into the sun!*"

But what proof has the world ever had, that the sun and earth are mutually drawn towards each other? Certainly none; for, if they were, the sun would be seen to increase in size, and felt to increase in heat, of which mankind has had no experience whatever, out of the

usual course of the seasons; therefore it is most reasonable to conclude, that there is not the least mutual gravitation between these two bodies. And then as to the *weight* of the sun, I would say to any one of these curious philosophers, as the angel said to Esdras, "Go thy way and *weigh me the weight of the fire.*" Esdras answered, "What man is able to do that?" Newton has done it, his disciples exultingly exclaim; the immortal Newton has done it! If so, I suppose it would be extremely satisfactory to some doubting enquirers if, by way of *experiment* and *demonstration,* they would place the flame of a candle in their balances, and tell us the weight of it. Let their sublime imaginations cease to carry their mathematical scales to the sun, until they have weighed the fire at home; for, until the weight of that be fairly ascertained, I am of opinion, that the most timid of their believers need not be under any serious apprehension of being precipitated, with the earth, into the flaming billows of the sun, by any defect or derangement of the *rectilineal impulse!*

"There is no such thing in nature as a heavy body moving round a light one as its centre of motion. A pebble fastened to a millstone *by a string* may, by an easy impulse, be made to circulate round a millstone; but no impulse can make a millstone circulate round a *loose* pebble."

Is it not as easy, O philosophers, to make a millstone circulate round a *loose* pebble, as a pebble round a *loose* millstone, unless both are carried? Can you give a motion to either the one or the other, without the aid of manual or mechanical powers? But there is no occasion to expend much labour in arguing upon the matter: for, though the comparison of the sun to a millstone be a Greek idea borrowed from Anaxagoras, I do not con-

sider the similarity to be remarkably exact; nor is the earth connected *by a string* to that luminary. But these matters, we are told, are too high for the contemplation of the *vulgar:* let us then proceed to others of more immediate gratification to them.

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## THE TIDES.

Philosophers inform us that "the only *vulgar* instance we have of the mutual gravitation of the celestial bodies," is the operation of the moon upon the tides; and that it was first discovered by Kepler: to prove which they quote a passage from his works. Kepler's account of the matter is however to be seen, nearly verbatim in Pliny's Natural History published about one thousand five hundred years before. It was the opinion of both these philosophers, that the planets were *animated bodies;* and as between such there are undoubted attractions, their belief was far more rational and consistent than the doctrine of the Newtonians.

However, the latter assure us, that "the sun's influence in raising the tides is *but small in comparison of the moon's;* for though the *earth's diameter* bears a *considerable* proportion to its *distance* from the *moon,* it is *next to nothing* when *compared* to its *distance from the sun;* and *therefore,* the *moon* must raise the tides *much higher* than they can be raised *by the sun.*"

It seems these philosophers, for convenience of argument, do not hesitate to evade the judgment of their own laws, which lay down as infallible truths, that the sun and all the planets attract each the others in the exact proportion of their respective *quantities of matter;* and that the power of attraction decreases as the squares of the distances increase. Now, according to the creed of the disciples of Newton, the volume of the

sun is 64,000,000 times greater than that of the moon, and his distance from the earth is four hundred times greater. The square of four hundred is 160,000; therefore the sun's attraction of the earth, supposing his mass to be equal to that of the moon, would be 160,000 times weaker than the moon's attraction; or, in other words, the mass of the sun, at the distance they place him, in order to possess on the surface of the earth an attraction equal to the moon's, ought to be 160,000 times greater than the moon: but, according to Newton, the density of the sun to that of the moon, is as 4891 to 1000: its mass of matter would in that case be to the mass of matter in the moon, as 13,085,259 to 1. But it is said that the distance of the sun is four hundred times greater than that of the moon: therefore the effect of the solar gravity on the tides compared with the lunar gravity would be as 13,085,259 to 160,000; or as 82 to 1.* We are, notwithstanding, very gravely told, that its effect in raising the tides is no more than a fourth or fifth of the moon's attraction. That is to say, about four hundred times less than it ought to be according to the *unerring* principles of gravity! But mark their further reasoning upon this point. "It is owing to the sun's immense size and distance, but the moon, because her distance in comparison to that of the sun from the earth, is very small, the forces with which she acts on different parts of the earth will vary more considerably from parallelism and equality."

* Newton believed the sun to be a body of fire; but it is now become fashionable, amongst philosophers, to consider it *a cold body of earth covered by a luminous atmosphere.* Does not this remarkable change in opinions require a new system of gravity? Can a body of earth be of the same density as a body of fire? Impossible!

This curious sophistry is, as I said, an evasion of their own boasted theory of gravity. It is a very important point and they cannot possibly get over it. The aspect, or angle of apparent magnitude, is very nearly the same in both luminaries; and the question here, is not concerning the effect of attraction upon a homogeneal body, but upon one composed of earth and water; and however the earthy parts might, or might not, be affected, it is very certain that the light, moveable, watery parts, by being acted upon by a force eighty-two times greater than that of the moon, would inevitably communicate such an amazing agitation to the ocean as would quite absorb and render imperceptible the comparatively weak effect of the moon's attraction; and also render the ocean completely unfit for the purposes of navigation. But nothing of the kind is experienced, and consequently the whole *theory* of gravity is imaginary and false.

But let us see how their theory will help them out in a more particular examination of the tides. If, as they state, the attraction of the moon, compared with that of the sun, varies considerably from parallelism and equality on different parts of the earth, why are not the tides higher within the corresponding limits of her declination north and south, than beyond those limits towards the poles? The recorded observations of navigators prove that the reverse has generally been noticed. Let us then compare the elevation prescribed by the Newtonian theory with the facts of experience.

Theory says, that "the force of the sun to move the sea, is to the mean force of the moon to move the same, as 1 to 4,4815—that the action of the sun changes the height of the sea two feet; and that of the moon about nine feet; making the mean agitation of both together, *in the open ocean*, about eleven feet; and this, it is added,

agrees *pretty well* with observations." O yes, *pretty well* with the observations of Newton and Halley in their studies; but not at all with the experienced observations of navigators. Cook's Voyages alone furnish facts quite sufficient to explode the hypothesis of lunar attraction.

By the theory of mechanical motion philosophers very confidently asserted, that the existence of a southern continent was absolutely necessary to preserve an *equilibrium* between the two hemispheres. "But," says the introduction to Cook's last voyage, "however *plausible* this theory may seem, at first sight, experience has abundantly detected its fallacy. In consequence of Capt. Cook's voyage now under consideration, we have a thorough knowledge of the state of the southern hemisphere, and can pronounce with certainty, that the *equilibrium* of the globe is effectually preserved, though the portion of the sea actually sailed through leaves no sufficient space for the *corresponding mass of land* which on *speculative arguments*" (concerning the earth's motion,) "had been maintained *to be necessary*." So much for *speculation* when examined by *experience*.

The great Pacific Ocean is, of all other parts of the globe, the most proper for examining the validity of Newton's theory of the tides; for, there the operation of the moon, supposing his hypothesis to be well grounded, would not be obstructed by head-lands, bays, gulfs, &c. In a space of many thousands of miles in every direction, there is nothing to interfere with the movements of this mighty ocean, excepting a few insignificant islands just rising here and there above the surface, which, comparatively, no more obstruct its motions than the nilometer does the overflowings of the river Nile. How then does theory agree with observation there? Mr. Wales, the astronomer, who accompa-

nied Cook, tells us: his words are;—"in these observations some *very curious* and even *unexpected* circumstances have offered themselves to our consideration. It will be sufficient to instance the *exceedingly small height* to which the tide rises in the *middle* of the great Pacific Ocean; where *it falls short two-thirds at least* of what might have been expected from *theory* and *calculation.*"*

Cook says that the tides at the Sandwich Islands are "so inconsiderable, that it is hardly possible at any time to tell whether they had high or low water; or whether the sea ebbed or flowed. At Van Diemen's Land he found *the perpendicular rise* to be *eighteen inches;* and it *never* appeared to have *exceeded thirty inches.* At the Friendly Isles, he observed it was *only* in the *channels* and a few places *near the shore* that the *motion* of the tide was *perceivable;* it rose from three to six feet, which was *the most considerable elevation that he had met with in that ocean* BETWEEN THE TROPICS. At Otaheite it was proved that the tides *never* rose *higher* than *fourteen inches at most;* and that it was high water *nearly at noon, as well at the quadratures as at the full and change of the moon.*†

* If Newton could have foreseen the discoveries of Cook, he no doubt could have better accommodated to them his "noble contrivance" of gravity. His disciples and believers have been very plausibly taught to think, that the phenomena result from the physical principles and laws of motion which he has laid down. But the fact was, that he, in all cases, accommodated his theory to the appearances. It seems remarkable, when Mr. Wales really discovered the fallacy of the Newtonian theory, as it is applied to explain the tides, (which philosophers assure us is the *only vulgar instance* we have of the *mutual gravitation of the heavenly bodies,*) that that discovery did not immediately lead him into an examination of its principles. He was said to be an eminent mathematician; and he must therefore have been well qualified for the task.

† *This* sufficiently refutes the Newtonian assertion, that, "High water takes place about three hours *after* the moon passes the

These places are situated as follows.

| | *Lat. S.* | *Long. E.* |
|---|---|---|
| | ° ′ | ° ′ |
| Sandwich Islands - - - | 21. 29 | 200. 12 |
| Friendly Islands - - - | 21. 8 | 184. 15 |
| Otaheite - - - - - - - | 17. 29 | 210. 22 |
| Van Diemen's Land - | 43. 21 | 147. 29 |

Where then is the "vulgar instance" of the mutual attraction of the celestial bodies? In the great ocean, according to their theory, where it ought to exist, it is not to be found. The rise of a few inches there is clearly owing to the small islands obstructing the force of the currents. And these instances appear, in my judgment, quite sufficient to prove that the heights of the tides are universally proportionate to the forces of the currents, taking into consideration the forms and situations of the shores, bays, gulfs and mouths of the rivers.

Philosophers have very properly been asked, why the Mediterranean and Baltic seas offer no confirmation, but, on the contrary, a refutation of their theory? Their answer is; "There are no tides in *lakes,* because they are generally *so small* that when the moon is *vertical* she attracts every part of them alike, and therefore by rendering all the water equally light no part of it can be raised higher than another. The Mediterranean and Baltic seas have very small elevations, because the inlets by which they communicate with the ocean are so narrow, that they cannot, in so short a time, receive or discharge enough to raise or sink their surfaces sensibly."

meridian." In Liverpool, where I reside, it is high water generally about half an hour *before* the moon passes the meridian. At Plymouth, six hours after; Isle of Wight, nine hours after; and at London fifteen hours after the moon has passed the meridian. The time differs every where.

The great ocean, as I have observed, does not confirm the Newtonian theory; nor is a verification of it to be found in the above-mentioned seas, because, forsooth, those seas and their inlets are too small! The whole passage is a web of sophistry. For, if the *verticity* of the moon prevents tides, that cause cannot be applicable to the Baltic or the Mediterranean; because she never was vertical to either of them. Whereas the Red Sea, which has a smaller surface to which the moon is every month vertical, has very high and rapid tides.* Nor can the narrowness of the inlets to the Mediterranean and Baltic account for their tides being nearly imperceptible; because the entrance to the Red Sea through the Straights of Babelmandel is likewise very narrow, and yet the tides, as I have stated, have considerable elevations.

But we will now suppose for argument's sake, that the entrance into the Mediterranean were twenty times its present width; that circumstance would have no very sensible effect upon it, even supposing the moon to attract according to the theory. Because that sea being more than two thousand miles long, and the period of the influx being only six hours, a body of water could not flow in that space of time more than twenty or thirty miles, and of course it could scarcely enter before the reflux would bring it back again. But as a proof that the influence of the moon does not govern the motion of those waters, and consequently no others in the least, the current *continually* sets into the

* So says Dr. Pocock in his book of travels; and the same is confirmed by Mr. Bruce when upon that sea, near the Island of Dahalac, in latitude 15°. "The tide," says he, "now entered with an unusual force, and ran more like the Nile, or a torrent, or stream conducted to turn a mill, than the sea or the effects of a tide, driving us in a manner truly tremendous."

straights of that sea in a direction exactly contrary to the moon's diurnal motion.

I believe there is not a sea upon the face of the globe, if observed with attention, that would not furnish ample evidence of the fallacy of the Newtonian theory of tides. The Euripus, between the Black and Mediterranean Seas, during certain days every moon, ebbs and flows seven to nine times in the twenty-four hours. At Tonkin, on the coast of China, there is only one flux and one reflux in twenty-four hours. The same is said to take place at Long Island on the coast of Scotland. Other varying instances might be adduced, if necessary, to demonstrate that Newton's generalising theory of the tides is entirely false, and therefore perfectly useless, excepting to authors and booksellers.*

The closet philosophers of that school have, to be sure, abundance of curious reasons ready at hand, and no less curious experiments, for the purpose of duping the understandings of those who do not like the trouble of examining for themselves. Their master, Galileo, from whom they received their laws of motion, moved backwards and forwards a trough of water, and drew reasons out of it, to illustrate his Theory of the Tides and the Motion of the Earth. The Newtonians following his example, agitate water in a tub, in order to demonstrate the reason of *two* tides in one lunar revolution

* Nothing has puzzled the philosophers more than the innumerable contradictions produced in nature all over the globe, to their generalising theory of the tides. Conscious of it an eminent writer remarks, "*If* the earth were *covered all over* with the sea *to a great depth*, the tides would be regularly subservient to *these laws*." If it were so, the fallacy of their *laws* could not be detected; but as things really are, the elevation of the land above the water, affords the means, all over the globe, of exposing and condemning their theory as perfectly useless. Tide tables are constructed from observation, and from that alone!

about the earth! Rather than appear to be at any loss how to account for an appearance, the imaginations of the Copernicans do not hesitate to invert the very order of nature. John Baptist Balianus, an astronomer of note, for the purpose of explaining certain monthly accelerations and retardations of the tides, insisted that the earth revolved round the moon! That conceit, however, did not please the learned Dr. Wallace.

If the agitations of the ocean were really produced by the moon's attraction, we should surely perceive some sensible proof of its influence upon watery clouds floating in the air; but we do not perceive any such effect; and it may easily be proved, even upon the principle of the Newtonian theory, that neither sea nor clouds could be visibly affected at the distance of the earth from the moon, supposing it to be 240,000 miles. Suppose, at the distance of a mile from the moon's surface, the force of attraction to be equal to that which presses the ocean here to its bed, then what would be its force at the distance of 240,000 miles from the moon? According to theory it diminishes, in proportion to the increase of the squares of the distances from the centre: suppose the moon's surface to be one thousand miles from her centre, the square of 240 is 57,600; therefore the attraction of the moon, upon our seas and oceans, would bear the same proportion to the pressure of the water upon the earth as 1 to 57,600, and of course its effect could not be in the least perceptible.

But it is most strenuously contended by the mathematical followers of the Keplerian hypothesis, that the agreement of the spring tides with the conjunction and opposition of the luminaries, is a decisive proof of the moon's attraction. Does it then naturally follow, because two bodies move in concert, that they must

therefore necessarily attract each other? Just principles of reasoning do not require that conclusion. God has providentially appointed to many parts of the habitable globe an extraordinary flux of the ocean for several days every fortnight; and the moon, by an exact coincidence of motion, serves as a perpetual index to the tides, whereby mathematicians are enabled, for the benefit of navigation, to calculate, beforehand, the periodical courses and returns of the tides, which otherwise could not be done. As to calculating tide-tables, upon what are termed *Newtonian principles*, it is all a farce, and something worse, to pretend to it. The late worthy and ingenious Mr. Wm. Hutchinson, of Liverpool, rendered a more important service to navigation, by noting the heights of the tides during the course of at least a whole lunar period, than ever was rendered by all the most curious theories put together.

The Almighty Creator has ordered the diversity of the tides, according to his own infinite wisdom, as most suitable to each particular part of the globe; whether for preserving sweetness in the ocean by circulation, or as ministering to the convenience of navigation. His divine œconomy produces an endless variety: but the weak, narrow, generalising theories of men, if put in practice, would most certainly ruin every thing. The very unevennesses on the surface of the globe, such as mountains and the beds of rivers, seas and oceans, as well as the movements of the water, must have been formed and appointed with wise design, by the express power and appointment of God. For, if they were left to the general operation of what the Newtonians term their *mechanical philosophy*, it may easily be conceived what fatal effects would necessarily result from such a fortuitous confusion of things! God has appointed to

all things their orderly limits; and this divine philosophy is emphatically intimated in the passage where it is demanded of Job, "Who shut up the sea with doors when it brake forth, as if it had issued out of the womb; when I made the cloud the garment thereof and thick darkness a swaddling band for it, and brake up for it my *decreed place*, and set bars and doors; and said, HITHERTO SHALT THOU COME, BUT NO FURTHER; AND HERE SHALL THY PROUD WAVES BE STAYED!"

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## IMAGINARY DECAYS OF THE UNIVERSE.

Sir Isaac Newton considered the universe as a machine which gets worse for wear, and which, in his opinion, will in time be unfit for the purposes for which it was designed. "The inequalities of the planetary motions," said he, "must constantly increase, by slow degrees, till they render the present frame of nature *unfit for the purposes it now serves.*"* It is however but fair to notice, that a celebrated astronomer of the present day, who some suppose to have been raised up to put a finishing hand to such parts of the system as Newton left incomplete, has, in some measure, made provision, for these imaginary decays and derangements of the universe, by his doctrine of destruction and re-production; for, he is of opinion, that the *nebulæ* or *clusters* of stars, which are seen in various parts of the heaven, are the *laboratories of the universe;* in which old crazy suns and systems are repaired or formed anew. "We ought," says he, "perhaps to look upon such clusters, and the destruction of a star" *(sun)* "now and then in *some*

* I have an old wooden clock with a larum, which formerly served to awake me at any hour I wished to rise in the mornings; but I find it now gets *worse for wear*, and I really think its increasing irregularities are such as will shortly render it unfit for use!

*thousands of ages*, as the *very means* by which the whole is *preserved* and *renewed*. These clusters may be *the laboratories of the universe*, wherein the most salutary *remedies* for the *decays* of the whole are *prepared*. The stars forming these extraordinary nebulæ, by some *decay or waste of nature*,† being no longer fit for their former purposes, and having their *projectile forces*, if any such they had, retarded in each other's atmosphere, may *rush* at last *together;* and either in *succession*, or by *one general tremendous shock*, *unite* into a *new body*." Here is a new sun, a mighty sun, supposed to be formed from a number of decayed ones: we may add, alas! what would become of all the worlds, with all their inhabitants, which we are told revolve about and are enlightened by these suns? They must of course rush along with the old suns, (their centres,) and serve as fuel to light up the new one! But here another curious question very naturally occurs: by what mechanical or chemical process, in these wonderful *laboratories*, are new worlds, and new people on them, formed to revolve about this new sun? Is it, as Newton believed, *by sediments of light forming themselves?* It is a question sufficiently important to engage and exercise the profound sagacity of philosophers; and the complete solution of it would, I think, give full employment to all the Powers and subtile Spirits of Newton. Another philosopher has possitively assured us, that these tremendous operations have absolutely commenced in the stupendous laboratories of the universe.

* "Decay or waste of nature," might with some propriety be applied to *animated* bodies; but as we perceive nothing of the kind, in sun, moon, or earth, which come more immediately under our examination, we may of course estimate this notable supposition in proportion to its value; which according to Mr. Burchell's emphatic term, amounts to—*fudge!*

Mr. Good, in a note, page 362, of the first volume of his translation of *De Rerum Natura*, (where he is commenting on a passage from Origen, who imagined that all things in nature were in *a state of decay;* becoming more and more scarce, and getting worse and worse;) asserts, that "*Suns* and *whole planetary systems*, have already *disappeared* from *their stations in the horizon*, dissolved, perhaps, to primitive non-entity; or *resorbed* in the *material* and *central mass of universal nature*, from which they were *first projected*, and *new creations have been discovered in their stead*. What is there then in the system of the earth itself, to enable it to resist the common fate? upon every analogy of reasoning, it also must eventually yield, and it is *probably decaying at the present moment*." To attempt to reason upon this wonderful passage, or to ask for information concerning these stupendous events, would be time lost: as Mr. Good appears from his writings to be a worthy, diligent and accomplished man, I am sorry to find such sentiments in the same note, along with his judicious comments on the wild theories of Mr. Godwin and M. Condorcet.

With regard to these perturbations, irregularities, derangements and destructions, which, as we have been taught, are the inevitable effects of the mutual and universal attractions of the celestial bodies; it is consoling to observe, that a few writers who have recently treated upon the subject, begin to perceive the absurd conclusions which necessarily flow from the doctrine; a philosopher, whom I have already quoted, asserts, that "Mr. De la Grange has *demonstrated* that no such disorder will ever happen. That the *greatest deviation* from the most regular motions will be *almost insensible*, and that they are all periodical; waxing to nothing, and again rising to their small maximums. He shews also

that the greatest perturbations are so moderate, that *none but an astronomer,*" (Oh no, none but an astronomer!) "will observe any difference between this perturbed state and the mean state of the system. *The mean distances and the mean periods remain for ever the same.*"*

Assuredly, O wise philosophers, you must all be brought to acknowledge *that,* however opposite to the profound results of your master's sagacious and elaborate investigations of the perturbations of gravity! "In short," says the same writer, "the whole assemblage (of worlds,) "will continue *almost* to *eternity* in a state fit for its present purposes, and *not distinguishable from its present state,* except by the *prying* eyes of *an astronomer.*" If the world continue fit for its present purposes *almost* to *eternity,* its inhabitants will care very little about the curious perturbations which their *prying eyes* have discovered. They, with astonishing gravity, lately told us, that they had *discovered* that the moon's acceleration is about eleven seconds in a century;† that is to say, gentle reader, at the rate of about one degree in 20,000 years! No great danger of detection upon that point.

* Notwithstanding this opinion, they, a few years ago, revived the subject in France, and even proposed a prize of the value of £250 for a theory of perturbations. The money would be well laid out; it is an alarming subject, and the publick ought to be informed of the fate that awaits them.

† "Consequently other planets, and among them the earth, must have a similar acceleration. If the motion of the earth be accelerated, it must be owing to its approaching the centre of motion; and, if it do, will it not ultimately *fall into the sun?* The danger of this, indeed, must be *infinitely remote,* for the acceleration is *extremely slow.*" (Why not *infinitely slow?*)—French Institute, 1809.

# CHAPTER V.

ON COMETS;—NEWTONIAN DOCTRINES CONCERNING THEIR INCONCEIVABLE VELOCITIES, HEAT, PERIODICAL APPEARANCES AND HORRIBLE CONSEQUENCES;—ONE OF THEM SO DERANGED BY GRAVITY THAT EVEN ASTRONOMERS DO NOT KNOW WHAT IS BECOME OF IT;—ALARMING AND CONTRADICTORY OPINIONS OF PHILOSOPHERS;—THE VULGAR OPINION UNIFORM AND RATIONAL.

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Another confirmation of the fallacy of the theory of gravitation, is to be found in the result of its application to account for the cometary motions. In the early part of the last century, when the system became pretty generally received, several of those mathematicians who had adopted it, examined such accounts of the appearances of comets as history had recorded; and in a catalogue of several hundreds a few seemed to have appeared at nearly equal periods one from the other, under somewhat similar circumstances. This pretended coincidence was with avidity laid hold of by Halley, and considered as a confirmation of certain ancient opinions, (particularly that of Pythagoras the Greek, and Seneca the Roman philosopher,) that comets were lasting bodies, as the planets, having regular uniform periods: and, from their apparently near approach to the sun, Sir Isaac Newton, very consistently, incorporated them with his own system, and asserted that they performed their revolutions about the sun by centrifugal and cen-

tripetal forces. He accommodated them with elliptic, parabolic, or hyperbolic orbits, according to the length of time they were visible, and the apparent angular velocity of their motions. It being received as an undoubted mathematical truth, that the distance of the sun from the earth is 95,000,000 of miles, the supporters of this system are obliged to measure the magnitudes, distances, and velocities of the other bodies belonging to it, by that enormous scale. Newton accordingly ascribed to the comet of 1680, a velocity of 880,000 miles an hour! Extravagant however as that is, it comes far short of the account given by Mr. Brydone of a comet seen by him, when at Palermo, in the year 1770; according to his computation that comet moved at the rate of 2,500,000 miles an hour, or 700 miles in a second of time; which is 5,200 times quicker than a cannon-ball;—the motion of lightning is nothing to be compared to it! Since the generality of Europeans believe these wonders issuing from Newton and his followers, as confidently as the people in the East believe the communications promulgated by the Grand Lama of Thibet and his priests, it is by no means surprising that the former, while exulting over the revelations of Newton, look down with contempt upon the simple philosophy and limited mathematics of the ancients, while they exclaim with equal falsehood and presumption,

"On *facts* not *fiction* rests his fame
Who spann'd the arch of heaven's eternal frame."

The forms assigned by Newton to the cometary orbits, are quite incompatible with any *known* laws of motion and attraction on the earth. He says the sun's action upon bodies diminishes, and that consequently their gravities are less, in proportion as they recede from

him; or, in other words, the matter contained in that body which revolves in the orbit nearest to him, is more powerfully attracted, and therefore heavier, than bodies performing their revolutions in orbits more distant from him. In conformity with this reasoning he asserts, that on a comet's approach to the sun, its motion is accelerated; and that when it recedes from that luminary, its motion is in a similar degree retarded, that is, in the reciprocal duplicate proportion. If we calculate by this rule and admit, as Sir Isaac asserted, that the comet of 1680, when in its perihelion, or nearest approach to the sun, was within 150,000 miles of him, namely, a sixth part of his diameter; and that in its aphelion, or that end of its orbit most distant from the sun, it was not less than 11,200,000,000 of miles, we shall find that the sun's attractive power upon it is above 5,500,000,000 times greater in the former than in the latter situation. By what miraculous law of motion then could the comet, being so powerfully acted upon, quit the neighbourhood of the sun? How could it possibly escape the Newtonian hell and continue its course? These philosophers may assert, that it is effected by some miraculous impulse from the centre of gravity! They may, with their usual confidence, refer us to their favourite experiment of their finger, string and ball; and so *demonstrate*, that the ball flies round with a velocity equal to the impulse of the finger: but this, though the boasted foundation of their system, and illustrated by the fluxional calculus, will not, I hope, much longer entrap the faith of men of sense, when they come to reflect upon those admirable and harmonious motions of the heavenly bodies, designed by infinite Wisdom for the use of man.

From an opinion held by certain heathen philosophers, Dr. Halley was induced to compare a number of these appearances, in order to find out whether they were regular and periodical in their visits; he accordingly ventured to predict the return of *two;* that *one* would re-appear in the year 1758 after a period of seventy-six years: and it is rather a curious circumstance, that "when the attention of astronomers" (as one of them mentions) "was called to this subject by the expectation of the return of the comet of 1759, no less than *seven* were observed in the course of so many years." I believe however, that none besides astronomers saw that number: however, one of these real, or pretended comets, was selected, for the honor of Dr. Halley and the system, and declared to be the identical comet foretold by him! Its appearance in 1759, instead of 1757, or 1758, as predicted, was explained in the same manner in which the Newtonians account for other differences which occasionally occur between the celestial motions and their own calculations: namely, by the attraction of the superior planets, which, they say, may *disturb* the comets on their way, draw them out of their courses, and thereby cause them to be several months longer upon their journeys than might have happened when describing former revolutions; and in some cases absolutely prevent their return!

There are some curious particulars connected with the history of the comet of 1759 which I shall notice. Dr. Halley, in his "Synopsis of the Astronomy of Comets," appears to have expended immense labour upon the subject. He constructed tables which he states were the results of a *prodigious deal of calculation.* Upon one of which tables in particular, he says he spared "*no labour,* that it might *come forth perfect,* as a thing *consecrated to*

*posterity*, and to *last as long as the science of astronomy itself!*" He tells us that he spent many years in speculating upon parabolic and elliptical cometary orbits, and, like all other speculators, his views were extremely ardent and sanguine. Whether his tables will last as long as the science of astronomy itself I will not say; but I can positively assert, that one hundred years have elapsed since the construction of them, and hitherto they have not been of the least use. He examined from history the particulars connected with the appearances of the comets of 1531, 1607 and 1682, and he laboured hard to invent the figure of an orbit that would fit the three appearances; but, as he was not able to do it, he laid the fault upon the actual observers and their defective instruments, and insisted, that his imaginary orbit, and his calculations upon it, ought to be taken in preference to what the observers of those comets really saw. He was extremely anxious that *the system of gravity* should be *confirmed* by *the fulfilment of his prediction* that a comet would appear *in*, or *about*, the year 1758; and that it should be received as the same comet that he supposed had appeared in the years 1531, 1607 and 1682 as before mentioned: "Wherefore," said he "if, according to what we have already said, it should return again *about* the year 1758, candid posterity will not refuse to acknowledge that this was *first discovered by an Englishman.*" As the statement of La Place is rather curious, and will give us some insight into the *management* of this comet, I will copy it out for the satisfaction of the true believers. "It *is true*," says he, "that the period of the *first revolution* is *thirteen months longer than the second.* But this great astronomer (Halley) thought, with good reason, that the *attraction of the planets*, particularly of Jupiter and Saturn, might have occasioned this difference, and

after a vague estimate of this action for the course of the following period, he judged that it would *retard* the return of the comet, and he fixed it at the end of 1758, or the commencement of 1759." Halley, as well as La Place, it seems, well knew the value of the *attractions* of Jupiter and Saturn in occasionally helping them out in their erroneous calculations, as will be shewn hereafter. "Having," says the former, "touched upon these things, I shall leave them to be discussed by the care of posterity, *after the truth is found out by the event.*" La Place then proceeds. "This *prediction* was *too important* in itself, and *too intimately connected with the theory of universal gravitation*, not to excite the curiosity of *all those who were interested* in the progress *of the sciences;*" (meaning *gravitation,*) "for about this time geometricians were *very much engaged* in *extending the application of the theory.* During the *whole year of* 1757, astronomers *looked for this comet;*" (yes, and during the *whole of* 1758) "and Clairault, who had been one of the first to solve the problem of the three bodies, applied his solution to the *determination* of *the inequalities* which the comet had sustained *by the action of Jupiter and Saturn;*" (This was what Halley had desired.) The 14th November, 1758, *he announced* in the Acamedy of Sciences, that the *interval* of the return of the comet to its perihelion, *would be six hundred and eighteen days longer* in the *present actual period* than in the *former one*, and that consequently the comet would pass its perihelion about the middle of April, 1759." The theory, then, required that this comet *should appear about that time.* But to whom did it appear? Why, truly, we are told, by La Place, that Clairault "had the satisfaction of *seeing his prediction accomplished* on the 12th March, 1759." On looking into the philosophical transactions of that year,

I find it stated that two mathematicians, a Mr. Munckley of Lincoln's Inn, and a Mr. Bevis, saw a comet on the 30th April in that year, and on two or three evenings afterwards, *near the horizon* in *the south:* one of the accounts is not quite clear as to whether it had a tail or not; it states, that it appeared to him to be rather surrounded with a *circular haziness than a tail.* The other saw a tail on the 1st May, but not afterwards; though La Place says, that the *same comet* in the year 1456 had *a long tail* which *spread consternation over all Europe!* The commencement of Mr. Bevis's letter is rather curious; he says, "I had acquainted *some of my friends,* that it was my opinion *a comet* would *hardly* arise above our horizon of London, *Sunday, April the 29th;* but that *probably we might see one on April 30th.*" Wonderful to tell, he says he accordingly did see one on Monday! *Who,* or *what,* could have put him in the possession of the secret? The first time *both* these gentlemen saw it, was *on the same evening;* and the comet having answered the important purpose of fulfilling the predictions of Halley, Clairault and Bevis, it quickly retired, without, I believe, ever having once been seen by the *people* of either England or France. If the fact were otherwise, I shall be glad to be informed.

We are gravely told by professor Robison, that "a comet observed in 1770, by Lexel Prosperin, and other *accurate* astronomers, has been so much *deranged* in its motion that *its orbit has been totally changed!* Its mean distance, period, and perihelion distance, calculated from good observations, which had been continued during three months, agreed with all the observations within *one minute* of a degree! In its aphelion it is a small matter more remote than Jupiter, and *must have been* so near him in 1767, that its gravitation to Jupiter

*must have been*" (how strong is the faith in gravitation!) "thrice as great as that to the sun." (No, no; not if your gravity is as the quantities of matter operating according to the squares of the distances,) "moreover in its revolution following this appearance in 1770, namely on the 23d of August, 1777, it *must have* come vastly nearer to Jupiter, and its gravitation to Jupiter *must have* exceeded its gravitation to the sun, more than two hundred times. No wonder then that it has been diverted into *quite a different path*, and that *astronomers cannot tell what is become of it*. And this by the way suggests some very singular and *momentous reflections!*"

No doubt, serious reader, such passages as this, coming from one of the principals of a college, are calculated to suggest very "momentous reflections." And the first that occurs to me is this: are men who can coolly imagine, and then deliberately publish such absurd notions, fit to be entrusted with the education of youth? These philosophers first imagine that worlds form themselves out of atoms and vapour from the sun; then that they take fire and become comets, which are ultimately destined to recruit the *decaying* solar fire! But here is a cometary world so *deranged*, by the invisible influence of gravity, that it has left its natural course, and *even astronomers do not know what is become of it!* If appearances do not confirm their curious computations, there is, forsooth, some failure in the order of the celestial motions; *their computations* must by no means be called in question. There is however one *question* which at this moment seems very naturally to arise out of the subject before us. Are the comets *deranged*, or the philosophers who teach such things?

There was another comet, which, after a period of one hundred and twenty-nine years, Dr. Halley believed

would appear in 1790. The astronomers were accordingly extremely sanguine in their expectations, and for a considerable time kept a diligent watch to hail and announce its return; but it was time and labour lost; no comet appeared. The disappointment, however, did not in the least shake their faith in the records of Halley; for they concluded, that "its non-appearance might be owing to the unfavourable situation of the earth." Ah, unfortunate philosophers! What pity that the earth stood in their light!

I shall now add the opinions of a few of our distinguished philosophers upon the nature and effects of comets; by which it will perhaps appear to some readers, that, as they in general disagree, they may all be wrong; and that after all that has been said by the learned in contempt of those whom they term the *vulgar*, it is very possible that the impressions of the vulgar may be found at last to be tolerably correct.

In the same manner that Sir Isaac Newton mathematically *proved* the relative forces of attraction, he contended that the comet of 1680 was heated by the sun two thousand times hotter than red hot iron! Some of his followers of the present day it seems disagree in opinion with him on that point; owing, probably, to the difficulty of even imagining such an excessive degree of heat, or to the still greater difficulty of conceiving the existence of any kind of matter, even gold, capable of supporting it for a moment. However that may be, they have run into another extreme. They are not content to suppose that the comets travel about the vast orbits ascribed to them, *without inhabitants:* and as they cannot conceive that human beings can exist on a body in such a dreadful state of ignition, as Sir Isaac professed to demonstrate; they, in their own way endeavour to

demonstrate, in the first place, that the sun itself is perfectly cool, and then, as a natural consequence, that the comets are equally so. They insist that heat does not proceed with the rays of light from the sun, but that a certain sensation of what is *vulgarly termed heat*, is caused by a peculiar operation of the rays on the surface of bodies !*

This curious notion they seem to have picked up amongst the ancient dogmas of Democritus, Sextus Empericus and others. Doctor Dutens, while commenting upon the knowledge of the ancients, adopted some of their sophisms. Amongst other things he asserts, that "there is *nothing more certain* than that the light we see *as it were* in the sun, *belongs not to that planet*, but is *an idea raised by it in our minds*." The senses of sight and feeling are certainly opposed to this curious notion; so likewise is the first chapter of Genesis; for it is there expressly recorded, that the great light, the sun, was created several days anterior to the creation of man, and therefore really and truly existed, and continues to exist, independently of man's ideas or perception. "All the light of every day comes from the sun." Eccl. xxxiii. 7.

Comets, in all periods of their appearance, and in every country, both civilized and barbarous, have awakened the apprehensions and excited the admiration of the nations; and philosophers, who generally appear anxious to solve every difficulty, and explain every unusual appearance, have occasionally published speculations upon their nature and uses. Ricciolus, an eminent astronomer of the seventeenth century, seems however to

* La Lande, the celebrated French astronomer, sticks to the old opinion. He expresses his belief that the sun is an ocean of fire; and at the same time observes, that Dr. Herschell, who maintains the contrary opinion, is more to be admired for his observations than his hypothesis.

have had more candour than the more modern speculators in that science; he considered comets as "Splendid ænigmas proposed by God, but never to be resolved by man." His opinion has been sufficiently verified by the wild, extravagant, and contradictory doctrines, of modern philosophers.

History mentions, that certain philosophers, who lived before Aristotle's time, held that comets were lasting bodies, somewhat of the nature of planets; he however rejected that opinion, and described them as a sort of meteors elevated to the upper region of the air, where he supposed them to blaze until the matter of which they were composed was consumed. This idea Aristotle probably had from the learned Jew mentioned by his disciple Clearchus. Others, as Appian, Tycho and Kepler, imagined the head of a comet to be of a transparent nature, through which the solar rays penetrate and form what is called the tail: while another class represents them to be mere reflections or refractions of the solar light. Towards the latter end of the seventeenth century mathematics were applied to them, in order to increase the value of opinions; and Sir Isaac Newton's newly contrived method, combined with his fanciful orbits, raised them in the opinion of his followers, to a distinguished rank amongst the heavenly bodies. From Flamsted's observations on the comet of 1680, Newton and Euler pretended to calculate its periodical revolution. The former determined it to be five hundred and seventy-five years; but the latter, only one hundred and seventy: both, notwithstanding, calculated from exactly the same data! But even *those data* Mr. Cassini, and other astronomers of that time, declared to be erroneous; for, the *two* appearances, which Newton and his adherents pretended to be the approach to, and recession

from, the sun of *one and the same comet*, the other party contended, upon the ground of their own observations, were *two distinct and very different comets;* which opinion seems, in some degree, to be supported by the observations made by Dr. Hook with his telescope, though he sided with the English philosophers. Newton stood high in the estimation of his disciples, who believed he was able, by his superior sagacity, to ascertain better than all other men, the nature of a comet; for, according to their elevated metaphors,

"Sublime the burning galaxy he trod!"

Therefore, in this dispute, the stronger party of the Newtonians prevailed over the weaker party of their opponents, as they did in the celebrated contest concerning the distorted figure they ascribed to the earth. The world is not always satisfied with naked facts: therefore Newton dressed up his theory with his mathematical logic, magisterial method, and swelling sublimities; it accordingly had the desired effect and bore down all opposition. His disciples could not contemplate without admiration and amazement the idea of that comet flying closely past the sun with a velocity, as their master assured them, equal to one thousand eight hundred times that of a cannon ball, and receiving in its progress a heat, as was before observed, two thousand times greater than red-hot iron.—The enquiry, as to what kind of matter could bear a heat so intense, does not seem to have occurred to them: they were quite satisfied with his demonstrating that it would require fifty thousand years to cool! When it was further considered, that the same comet must have had the same degree of heat *nine times repeated since the creation*, and that, according to the great Dr. Hook, the flaming fire in its tail moved *many thousand times quicker than lightning!*—it was by

no means astonishing that serious men, such as Derham and Whiston, after having swallowed and digested the marvellous tale, should endeavour to propagate a belief that comets were the infernal regions!

Philosophers ridicule the simple impressions of the artless multitude, who are in the habit of contemplating comets, comparatively, as messengers sent by the Governor of the World to call mankind to reflection; or to hold up to the nations signs of approaching chastisement for their crimes! And where is the great impropriety or blameable weakness of this? History records many instances of cometary appearances immediately preceding extraordinary changes in the fortunes of distinguished individuals, or the revolutions of nations and powerful empires. Even the remarkable one that appeared about eleven years ago, and the mighty and stupendous events which immediately followed, cannot, I believe, have failed to confirm this view of them, as the most rational, in minds perhaps not greatly inferior, either in liberality of sentiment or enlargement of understanding, to those who are steeped in the mysteries of gravitation. But what grounds have the Newtonians for their doctrines; do facts or experience confirm them? If it be fanaticism to believe and to teach without the evidence of either the one or the other, the imputation of fanaticism clearly attaches to the Newtonian philosophers. They assiduously labour to impress a belief that the tail of a comet produced the universal deluge; struck the earth on its rapid passage; gave it a rotatory motion on its axis, and an oblique position in reference to the plane of its orbit, which have ever since continued: that is to say, we were whipped into a spinning condition, just as a boy lashes his top! The same writer argues on the

probability that a comet on its return from the sun will ultimately burn us all up!

While contemplating on the sad effects that *might* be produced by this comet on the planets, the imagination of Dr. Halley became so intensely heated, that he actually conceived and wrote a prayer against it; which was this, "But may the GREAT GOOD GOD avert a shock or contact of such great bodies moving with such forces, (which however is manifestly by no means impossible,) lest this most beautiful order of things be entirely destroyed and reduced into its ancient chaos! *but this by the by.*" That was going up like a *rocket*, and coming down like a *stick!* It is too important to pass over, *by the by*.

La Place says, "It is easy to represent the effects of such a shock upon the earth: the axis and motion of rotation changed, the waters abandoning their ancient position to precipitate themselves towards the new equator; the *greater part* of men and animals drowned in a *universal deluge*," (would not *the whole* in such case be drowned?) "or destroyed by the violence of the shock given to the terrestrial globe; whole species destroyed; all the monuments of human industry reversed: such are the disasters which the shock of a comet would produce." Here the philosophers are alarming the world with the possibility of a catastrophe, which God himself has solemnly declared shall never again take place. "I will establish my covenant with you; neither shall all flesh be cut off any more by the waters of a flood: neither shall there any more be a flood to destroy the earth." Genesis, chap. ix.

Philosophers may hold in contempt the honest presages of the "vulgar;" but what are the fears of the vulgar in comparison of those excited by the terror-

striking doctrines of the modern philosophers? The impressions of alarm were so strong upon the minds of many who anticipated the destruction of the world, by one of the comets which Dr. Halley pretended to foretel, that some well-meaning clergyman humanely preached and published a discourse under the title of "The *Folly* and *Danger* of *Enthusiasm*, in a Discourse on the *pretended Conflagration* by the Comet *which is to appear in* 1758." Well, notwithstanding these dreadful philosophical predictions so greatly terrified the nations, the civil powers never once thought of confining the presumptuous authors of them; though in the very same age they imprisoned, drove out, or persecuted to death, many who were divinely commissioned to foretel national punishments for blasphemy, crimes, and tyrannical cruelty to mankind.

La Place, in the passage following the one above quoted, endeavours to comfort his dupes with the assurance, that "whatever may be the cause assigned *by philosophers* to these phenomena, we may be perfectly at ease with respect to such a catastrophe during the short period of human life. But man is so disposed to yield to the dictates of fear, that the GREATEST CONSTERNATION was excited at Paris, and communicated to the provinces, in 1773, by a memoir of La Lande, in which *he determined*, of those comets which had been observed, the orbits that most nearly approached the earth: so true it is, that error, superstition, vain terrors, and all the *evils of ignorance*, are ever ready to start up, when the *light of science is unfortunately extinguished*." I most sincerely hope that such *philosophers* as these will not much longer be allowed to corrupt the people, by drawing them away from the truth, and by filling their minds with the "*evils of ignorance*." When the

"*light of science is extinguished,*" says he! was it not the *light* of that *science*, of which philosophers make so loud a boast, that excited all these VAIN TERRORS among the nations? Would the people, if they had even been left to the simple light of nature, for a single moment have thought of being burned up, drowned, or dashed into atoms, by a comet, had not such foolish doctrines been oracularly promulgated by *philosophers?* No, such wild ideas would never have entered their heads. And yet this *philosopher* had the impudence to tell us, in his closing passage, that the GREAT BENEFIT of their SUBLIME DISCOVERIES, has been the having *dissipated the alarms* occasioned by *extraordinary phenomena*, and destroyed the *errors* springing from the ignorance of our true relation with nature; though he had just before told us, that the reading of La Lande's memoir, had excited in Paris and the provinces the GREATEST CONSTERNATION! It will ever be thus, while astronomers take flights beyond the useful sphere allotted to them, and employ their imaginations in chimerical creations, or in astrological prognostications; in such employments they completely lose sight of the true dignity and credit of the science, and turn that into romance, which, like all other branches of useful knowledge, was designed to minister to the real use and advantage of society. In this view I agree in sentiment with John of Sarisbury, who wrote about seven hundred years ago. "The knowledge of astronomy," said he, "is a noble and glorious science, if it keep its retainers within the bounds of moderation, but if it once leaps over those, and runs into vanity and extravagancy, it is no longer a part of philosophy, but becomes a wicked engine to entrap mankind."

I must not, however, omit to mention, that there were a few of the disciples of Newton and Halley, who upon

this subject ventured to differ from their masters, by promulgating opinions of a more tranquillising character. One of them, whose book is now before me, is of opinion that in case a comet "should be more *attracted* by the earth than by the sun, we might, *by that means*, acquire *another moon*, which would be a *change to our advantage*, rather than a subject of *terror and dismay*." He does not however condescend to shew, by reasons, how such an acquisition would operate to our advantage: the inhabitants of this town, and neighbourhood, for example, would most certainly be ruined; for, if according to the principles of gravity, the tides should acquire a double elevation, a vast number of buildings, and adjoining fields, would inevitably be rendered useless, by being laid under water. Nor would that be the only calamity; for, according to the adopted Greek opinion of the moon's powerful operation upon human brains, the present number of *lunatics* would be doubled.*

Sir Isaac Newton himself, in one place, considers comets as the great conservators of the universe; believing, "that the spirits which make the subtilest and *best* part of our air, and *which* is *absolutely requisite* for the *life* and *being* of *all things*, comes *principally* from the *comets*!" Somewhat similar is the account of Dr. Hamilton, who supposes them to be "vehicles *appointed* to *gather*, and *bring back*, the *electrical fluid*, which he imagines to escape continually from the planets."

* When a Lord Chancellor issues a commission in the nature of a writ *De Lunatico inquirendo*; (that is, to enquire if a person be *mooned*;) it seems to countenance the practice of Judicial Astrology: for, how can a jury be qualified to judge, whether a man has become deranged in his intellects, by lunar influence, unless the parties composing it have studied astrology? If neither the Chancellor, nor the Jury, study astrology, why derive and retain the *term* from the ancients, who worshipped *Luna*? What an inconsistency!

This imputed service would, perhaps, have been rendered more feasible, had he given them the *animation, wings,* and *fins* of Newton's great prototype Kepler, by means of which he imagined them to move through the ætherial spaces! Descartes supposed that comets were old *worn-out suns,* carried from their centres by vortices, and so brought within the bounds of the solar system!

In contradistinction to the belief and doctrines of the great body of Newtonians, who in positive terms define comets "solid, compact, fixed, and durable bodies;" a few modern astronomers of eminence have concluded, from their own observations, that even their forms are changeable and sometimes of a vapid nature. According to the testimonies of Windelimus, Cysatus and Hevelius, they have frequently been observed to change into various shapes, even in the course of a few seconds, while in the act of looking at them;—no great proof that of a strong central gravity. The latter judged them to be solar exhalations; which opinion, with some modifications, was adopted by a Liverpool philosopher who, about fifty years ago, corresponded with Dr. Franklin upon the subject, and made himself rather merry at the idea of Newton and Halley gravely occupying their time in most elaborately calculating the *imaginary orbit of an ignis fatuus!*

I have now stated the principal doctrines of the modern Pythagoreans concerning cometary appearances; and I think it is impossible to reflect upon them without entertaining a suspicion, that they have imbibed a considerable portion of that spirit which possessed their master when, in his cave at Samos, he studied those arts of imposture which, according to history, he afterwards played off upon the credulous people of Crotona. One Timon, a Greek writer, drew up his character in a few

words, when he described him, "the magician who loves nothing but vain glory, and who affects a gravity in his speech to entice men into his nets."

While philosophers are thus jarring amidst a perpetual war of opinions, the belief of the multitude, in most nations, is uniform and fixed; namely, that comets are SIGNS. And such, likewise, have been the opinions of learned men in every age, until the labours of modern philosophers began to remove, from the minds of men, the idea of a superintending Providence in the movements of the universe, and in the affairs of mankind: this might easily be shewn from the writings of historians, philosophers, and divines; but there is no occasion to take up the time of the reader by quoting passages from their works. And whatever salutary impressions of awe may be the effect of that belief, they are quite moderate when compared with the false alarms of drowning, burning, and horrible destruction, which, on the appearance of one of those bodies, are now excited in the minds of the credulous by Newtonian philosophers; who manage to give currency to their dogmas under a belief, industriously propagated, that they are clothed in mathematical demonstration! It was no doubt the abuse and misapplication of mathematics which induced Agrippa to declare, that the closer a man adheres to the favourite contrivances of mathematical professors, the more remote he will ever find himself from useful science. Tacitus says they were a deceitful people, and prohibited from Rome. It likewise appears from other writers, that under the reign of Augustus, and some of his successors in the empire, astronomers, philosophers, and mathematicians, were at different times expelled from the city. That severity on the part of those emperors, was, in some degree, justifiable, because

mathematics were prostituted to purposes of imposition, under the vain pretences of foretelling the destinies of individuals and states; as the same science is now used for the purpose of alarming and agitating weak minds, by prognostications of destruction to the globe. Such information can only proceed from the spiritual world, and has therefore nothing to do with the science of mathematics.

Therefore the Romans, though an idolatrous people, were wise in discouraging such impious vanities: yet the Christians not only tolerate, but encourage them, though the religion they profess clearly prohibits such practices, as criminal.* A prophet, of the Jewish nation, being forewarned that his fellow-citizens and countrymen would be carried away into captivity by a people who were under the influence and government of a regular system of mathematical delusion, gave them a wise and salutary injunction; "Learn not," said he, "the way of the heathen, and be *not afraid of the* SIGNS *of the heaven*, for the heathen *are dismayed at them.*"

This was a precaution worthy of the Great Legislator of the World, who by the promulgation of His Laws, and by His other dispensations, had constantly warned them against the follies and dangers of superstition; recommended to them the Divine Precepts, as infallible guides through life; and enjoined the practice of all the virtues to which those precepts steadily point;—temperance, prudence, justice and fortitude; which are such things, says the illustrious author of the Book of Wisdom, than which men can have nothing more profitable in this life. *Wisdom* viii. 7.

* There are, I think, three Astrological works published annually, in London, with the King's stamp upon them!

# CHAPTER VI.

**ON THE SUPPOSED DIURNAL MOTION OF THE EARTH, FOUNDED ON THE NEWTONIAN EXPERIMENTS OF THE SPINDLE AND SOFT BALL OF CLAY, IRON HOOP, MOP, PENDULUM, AND MEASUREMENTS OF A DEGREE ON THE EARTH;—OPPOSITE CONCLUSIONS OF PHILOSOPHERS.**

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In the foregoing observations I have shewn that the Newtonian laws of motion are nothing more than mere mathematical conceits;—that they have no real existence in the system of creation, and therefore can operate no other consequences than delusion and error in the minds of those who negligently rely upon them as substantial facts.

But, that it may not be said that I have uncandidly taken a partial view of the matter, I will now examine, and comment on, a few points which they contend are visible demonstrative proofs of their theory being grounded on nature and facts. One of the most eminent of such proofs, they say, is to be found in the turnip, or orange-shaped, figure of the earth. They first contend, upon the ground of their experiments, that such figure must necessarily result from their mechanical theory; and then they proceed, in their own way, to prove, by other experiments and observations, that such, in reality, is the form of the terrestrial globe.

To prove, that the oblate is the form naturally produced by their centrifugal motion, they, by way of

EXPERIMENT, stick a spindle through the centre of a *soft* ball of clay, and, by spinning it briskly, they observe that the clay has a tendency to contract at the poles, and to fly off the spindle! A certain astronomical professor exhibits the same effects by a *thin iron hoop* and a *rod*. "That this," says he, "*must be the consequence, appears from this experiment;* that if you take a thin iron hoop and make it revolve *swiftly* about one of its diameters, that diameter will be *diminished*, and the diameter which is perpendicular to it will be *increased;* now if we suppose the earth to revolve, the parts most distant from *its axis* must, from their greater velocity, have a greater tendency to *fly off from the axis*, and therefore that diameter which is perpendicular to the axis, *must be increased.*" Another admired author says the same doctrine is proved by a mop! "When a mop," says he, "is turned upon the arm by a quick circular motion, the *threads or thrums* are observed to rise *highest in the middle*, and the swifter the *mop is whirled*, the greater will be the force, and the particles will *fly off* with the *greater velocity.*"

These are genuine Newtonian experiments, designed to shew the principle and effect of the supposed diurnal motion of the earth; as the experiment of the string and ball, already described, was intended to illustrate the forces of the orbital motion. Some persons, who have not examined the ground-work of this celebrated system, may possibly imagine, that I am trifling with my readers—that such puerilities would have disgraced such renowned geniuses, and that therefore they could not possibly have introduced them as physical demonstrations. Be it known, however, to such, that a reference to their books will immediately convince them

that I do not in the least exaggerate.* These are truly their own sagacious experiments; their sublime simili-

* Dr. Desaguliers laid the following account before the Royal Society, and it was actually received and registered amongst their transactions!

"Upon an *axis of iron*, that could be made to turn swiftly, (by means of a *wheel* whose *string* went round a *pulley* fixed to the said axis,) Dr. Desaguliers slipped on two *iron hoops*, whose planes intersected each other at right angles, representing two colures, which being in a spring temper, sprung in such a manner as to be one ninety-sixth part longer in that diameter that coincided with the axis, than in the equatorial diameter; this proportion being the same that Mr. Cassini supposes to be between the axis and equatorial diameter of the earth: two circular plates, to which the said hoops were rivetted, had square holes, through which the axis passed; so that the two poles of the oblong spheroid, which the hoops described in their revolution, might approach together in such a manner, as to let them put on the form of a true sphere; when, by the whirling, the equatorial diameter of the machine swelled, and overpowered the elasticity of the hoops: a greater degree of swiftness turned the sphere into an oblate spheroid of Sir Isaac Newton's figure; a velocity still greater makes the disproportion of the diameters, such as those of Jupiter; and still the equatorial diameter increases with the centrifugal force."

Here was an *axis of iron*; a *wheel*; a *string*; a *pulley*; and *two iron hoops*; all set in rapid motion, to illustrate, or prove, Newton's imaginary figure of the earth, and by consequence, its rotatory motion! Had he twirled his *hoop*, before this Royal Society, to *prove*, that motion would raise the *hoop* in the *middle*, his machinery would have answered the object. But, as applicable to the globe, a *tee-totum* or *peg-top* would have been more suitable for the purpose; because such being firm and compact, they would have borne a greater similarity to the globe; and, on examination of them, after they had been spun, that learned society would have found, that the operation had not swelled out their sides in the least! No doubt the hoop, by motion, would have flown off in a tangent, had it not been linked to the spindle;—no *experiment* was necessary to satisfy the learned society of that. The question they should have propounded, according to their own doctrines, ought to have been simply this: can a body *revolving in a vacuum*, about its own *mathematical axis*, fly away *from itself?* Such a question might, at least, have put a stop to the expense of money and time, laid out in pursuing inapplicable experiments. The Newtonian philosophy had then recently triumphed over the Cartesian; and this experiment was brought

tudes! These are some of the *facts* alluded to by the reverend poet already quoted, upon which rest,

" *Those laws* that to their mighty orbits *chain*
The *circling spheres*, and *bound the raging main.*"

We show you, they exultingly exclaim, a system founded on the pyramidal base of experiments! Well, gentlemen, I have not whirled the mop, but I have considered your experiment: yet, I have not been able to discover the least similarity between this beautifully variegated globe, composed of water, soft earth, sand and solid rocks; and your soft ball of clay, iron hoop, and your thrums. But there is another particular in which the globe differs considerably from your experimental instruments, and which seems to have escaped your notice whilst brooding over your favourite experiments; the earth has no iron axis stuck through its poles, nor any other kind of axis from which its parts can recede, and therefore your experiment is quite inapplicable. But even were it otherwise, the manifest effect of a centrifugal force, operating with an impulse according to the experiment, and the theory founded upon it by Newton, would be instant destruction to the globe: because if, by a revolution in twenty-four hours, or in any other given time, that force could so far exceed the power of gravity, as to protuberate seventeen miles on the equator, I cannot conceive any thing to prevent it from rapidly increasing; for, according to theory, the gravity of the equatorial parts would decrease as those parts swelled out: and the diurnal motion continuing

forward to aid in the removal of Cassini's *oblong form*, in order that Newton's *oblate form* might occupy its place. The object was to destroy French bubbles, and raise English ones in their room. And this war of *bubbles* lasted, as I said before, fifty years, produced much *froth*, and the French Sçavans were conquered!

the same, the motion of the equatorial parts would increase by a uniform acceleration, until the whole would separate, and fly away from the centre. I remember, when I was at a pottery, that in the process of forming a vessel upon the wheel; suppose globular, or egg-shaped; if the rapid motion of the spindle overbalanced the cohesive temper of the clay, and thereby forced the forming vessel to swell out beyond its prescribed gauge, a continuance of the same velocity of motion would continue to increase its diameter, until it suddenly burst, and flew off the wheel in pieces. As therefore the globe is not so affected in the least, it is sufficiently manifest that the theory is false, and far more calculated to excite the scorn and derision of sensible men, than to form a foundation to support "Newton's immortality of renown!"

Now with regard to the experimental and sensible proofs of the oblate form of the earth, which these philosophers tell their followers they have obtained on the surface of it; I shall first notice that which they pretend to have derived from the unequal vibrations of the pendulum. By observation, they say, it has been found to beat slower at the equator than nearer to the poles; and in order to make a clock keep the same time at the equator as at the city of Paris, it is necessary to shorten the pendulum by a two-hundreth part of the whole length. When this effect was first said to have been observed on pendulums, Sir Isaac Newton and Mr. Huygens laid hold of the incident, and laboured hard to pass it off as a confirmation of their favourite theory of the earth's motion. But mark how widely these philosophical enthusiasts differed in their conclusions, though both calculated from exactly the same data. The former professed to *demonstrate mathematically*, that the polar

diameter was to the equatorial diameter as 689 to 692, being a difference of the two hundred and thirty-fifth part of the whole diameter; while the latter pretended, likewise, to *prove mathematically*, that the exact proportion one bore to the other, was as 577 to 875, being a difference of no less than about one-third of the whole diameter! The fallacy of the latter is sufficiently manifest from the circular appearance of the earth's shadow in a lunar eclipse. But Newton, more wary, well knew, that no observation, made upon the face of the globe, could by any means sensibly prove *his* statement of the matter to be true; he therefore, (and that was the most material point,) stated the difference to be so exceedingly small, that he had no fears of being detected: and his superior credit as a mathematician, secured to him the faith of his admirers, who, without hesitation, adopted his account of the matter as an important truth not to be questioned.

There were, however, certain learned men, who, in opposition to the *demonstrations* of these mathematicians, thought the difference in question was caused by the pendulum being affected by circumstances quite unconnected with the form of the earth. Messrs. Picart and De la Hire, two celebrated French philosophers, instead of ascribing the alterations in the vibration to the force of more, or less, gravity, produced experiments to prove, that the observed effects might possibly be caused by an increase of heat, in the torrid zone, lengthening the rods, and consequently lengthening the vibrations; or by cold producing the contrary effects.

When I formerly wrote upon this subject, I expressed an opinion, that the increased density of the air, on approaching towards the poles, would more naturally account for the irregularity of the pendulum's motion,

than the fancied distortion of the globe. Since then, on looking into the Philosophical Transactions, I find something like a confirmation of that opinion in the account there recorded of Dr. Derham's experiments. In treating of the figure of the earth, he seems to have paid no regard to the pretended experiments of the pendulum under the equator; "For," says he, "I have shewn" (No. 294, Phil. Trans.) "from the like variations in the air-pump, that this may arise from the rarity of the air *there* more than *here*." And in No. 480, the same writer is more particular; relating some experiments he had made on pendulums vibrating in an exhausted receiver, he observed, that "the arches of vibration, in vacuo, were larger than in the open air, or in the receiver before it was exhausted: that the enlargement or diminution of the arches of vibration, were constantly proportional to the quantity of air, or rarity or density of it, which was left in the receiver of the air-pump. And as the vibrations were larger or shorter, so the times were accordingly; viz. two seconds in an hour when the vibrations were largest, and less and less as the air was re-admitted, and the vibrations shortened." "Hence," says Mr. Stone, "the resistance of the air must certainly be a considerable obstacle to the equable going of a clock."

Here then are the opinions and experiments of Picart, De la Hire, Derham and Stone; opposed to the fancies of Sir Isaac Newton and Mr. Huygens, who also, as I have stated, widely differed in their own mathematical conclusions!

Diogenes, an ancient philosopher of Apollonia, successor to Anaxagoras, is said to have held an opinion that the earth was of an oval, or egg form; such also was the notion adopted by Kepler and after him by

Cassini, a French astronomer. But Newton opposed the latter by reasons drawn from, and built upon, his favorite theory and experiments of centrifugal forces. The dispute ran high; Louis XIV. took an interest in the question, and ordered the whole arc of the meridian passing through France to be measured, which was accomplished in the year 1718 by Picart, De la Hire and Cassini. The latter placing more dependance upon the accuracy of his measures, than upon conclusions drawn from Newton's theoretical reasoning, contended, that the true form of the earth was that of a prolate spheroid: But Newton, sitting in his chair, without measuring an inch, or taking a single observation, pertinaciously stuck to his own theory and obstinately insisted that its shape bore a nearer resemblance to that of a garden turnip or an orange. In this state of contending opinions the question was considered of high importance, involving in its decision the honor of the two nations! Accordingly the French King, in order to ascertain the point to a nicety, as he supposed, and put the matter to rest, resolved, no doubt with the advice of his first mathematicians, to send philosophers to the northern and southern parts of the earth for the purpose of taking the actual measure of a degree of the meridian in both situations. One company went to Bothnia in the north, and the other to Peru in the south. The latter having measured above three degrees, resolved that the first degree of the meridian from the equator was 56,753 toises. The philosophers who travelled to Lapland, having measured somewhat *less* than a degree of the meridian cutting the polar circle, gave in as the result of their calculation 57,422 toises for the length of a degree in Bothnia. These dimensions ascertained, as it was believed, with the most rigorous accuracy, were

every where received by astronomers, (as their books show,) with much exultation, as a complete confirmation of Newton's theory. But it now appears, if any reliance is to be placed upon the recent measurement of the same portion of the globe in Bothnia by the Swedish astronomers, that the French were very incorrect in their account; having made the degree there one hundred and ninety-six toises more than the true length. So that the account will stand thus.

| | |
|---|---|
| The length of a degree in the north, according the Swedish astronomers, - - - - - - - - | 57,226 |
| The length of a degree under the equinoctial, as reported by the French surveyors, - - - - | 56,753 |
| | 113,979 |
| The mean of which is | 56,989 |

Now it appears, that the mean differs from the two extreme lengths, only two hundred and thirty-seven toises, (a little more than the *error* of the French measure,) the two hundred and fortieth part of a whole degree or *one inch* in twenty feet! How far so small a difference could be *certainly* ascertained under the pitiable circumstances in which these poor frost-bitten mathematicians were placed, let the reader candidly judge from the account given by the French: whether the Swedes were more comfortably circumstanced I am not informed.

"In measuring the base line," says Maupertius, "we separated into two bands, each of which carried four rods of fir, each *thirty feet long*. I shall say nothing of the *fatigues* and *dangers* of this operation. Judge what it must be, *to walk in snow two feet deep*, with *heavy poles in our hands*, which we were obliged to be continually laying on the snow and lifting again: *in a cold so excessive that whenever we could taste a little brandy, the only*

*thing that could be kept liquid; our tongues and lips froze to the cup and came away bloody; in a cold that congealed the fingers of some of us, and threatened us with still more dismal accidents; while the extremities of our bodies were thus freezing, the rest, through excessive toil, was bathed in sweat."*

Had these surveyors sat down together before they started upon this dreary and perilous expedition, and coolly reflected, that the object of it was to determine a thing which, in truth, was not determinable; namely, to ascertain, to a certainty, the small difference of one inch in twenty feet, or thereabouts; they surely would not have persevered in the folly of the undertaking; but, like honest men, would have counselled the King, their master, to reserve his patronage and his bounty for the promotion of some scheme that, at least, would not have incurred an imputation of so great a defect of understanding, as appears to have been shown in the one before us.

The philosophers who travelled to the south, had, if possible, still greater difficulties to encounter. When placed upon the high mountains, making their observations, besides experiencing excessive cold, they were sometimes in such danger of being blown down the precipices, that even their Indian attendants were frightened away from them. In these dreary and alarming situations, both companies had to measure their base lines;—their terrestrial and celestial angles:—afterwards to try to reduce their measures to the level of the sea! And with all these extraordinary difficulties to surmount, they gravely professed to have discovered, that a degree under the equator, or at the polar circle, measured a quarter of a mile, more or less, than one in France! With as much colour of reason they might have asserted, that in the midst of a storm, they could shoot

an arrow, so skilfully as to split a hair at the distance of fifty yards! For even if they had had none of the difficulties to encounter which I have mentioned; an error of one-fourth of a minute in their celestial observations, would have rendered all their other operations useless; because such error would have comprehended as great a quantity as the assigned difference. And every man, who is experienced in the use of instruments for taking angles, will, if he be candid, acknowledge the impossibility of measuring them to a certainty within much less than a minute—particularly in the inconvenient situations I have described—even leaving out other weighty considerations, such as the imperfections of eye-sight, instruments, and the continual variations in the state of ærial refractions. The swagging of their measuring poles would cause a considerable error; and even the pole itself, if measured by a metallic foot, would be shorter in the northern than it would be in the southern latitudes. So that upon a just consideration of all the unconquerable obstacles that every where opposed these philosophers, through the whole process of their undertaking, I am of opinion, that Mr. La Lande, (in his History of Astronomy for 1805,) might have spared his expression of surprise, that his countrymen should have committed such a mistake at Tornea: the thing most surprising, in my opinion, is, that the measures of the different parties should so nearly coincide with each other, unless it be supposed, *that theory required a tolerably near agreement!*

Such, however, is the other *experimental proof* of the *pole-flattened* figure of the earth; and, thence, of its motion upon its axis. Whatever objections reflecting men may *now* think it liable to, it was *then* readily received and admitted along with the pendulum, to give

support to this favourite hypothesis; which, long before that time, had charmed and prepossessed nearly all the philosophers in Christendom. But, what is rather a curious circumstance, and certainly deserves to be noticed, is, that the measurements made in France, from which Cassini *mathematically demonstrated* that the form of the earth was an *oblong* spheroid, were afterwards brought forward to prove the *opposite figure*, namely, the *oblate* spheroid: and they assure us, that after "*proper corrections*" it agreed "*very well*" with the proofs fetched by the philosophers from the north and the south! The truth of the whole matter seems to be, that as the general current of public opinion ran in favour of the Newtonian theory, there was neither literary credit, nor chance of success to be had in resisting the stream; the few isolated objectors, therefore, though perhaps possessing superior knowledge, were soon put to silence amidst the universal plaudits of the great majority of the Newtonians.

# CHAPTER VII.

THE IMAGINARY MOTION OF THE EARTH IN AN ORBIT, CONTRADICTED BY SIGHT, REASON AND SCRIPTURE;—THE TENTH CHAPTER OF JOSHUA, AND THE THIRTY-EIGHTH OF ISAIAH, TROUBLESOME OBSTACLES TO PHILOSOPHERS;—ELABORATE ATTEMPTS OF BISHOP WILKINS, KEPLER, AND OTHERS, TO EXPLAIN AWAY CERTAIN PASSAGES;—CRITICAL REMARKS ON THE HEBREW NAMES OF THE SUN, MOON, AND OTHER HEAVENLY ORBS;—SEARCHES IN HEAVEN FOR CONFIRMATION OF THE OBLATE FIGURE OF THE EARTH;—DISAGREEMENT AMONGST THE NEWTONIANS CONCERNING THE APPARENT FORMS OF THE PLANETS.

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King Solomon, in the beginning of his book called The Preacher, affirms, that all things are in motion excepting the earth: that generation succeeds generation; that the sun moves about the earth; that the wind perpetually whirls about to the south, and from the south to the north, according to its circuits; that the rivers flow from their sources into the sea, and thence return to their sources: but the earth, says he, stands still for ever.* The same philosophical truths are corroborated by other passages of Scripture as well as by the certain

* But as some may think that this might be translated "*remains* or *continues* for ever;" it may be proper to notice another passage or two. "He laid the foundation of the earth that it should not be moved for ever." Psal. civ. 5. "Thou hast established the earth and it standeth." Psal. cxix. 90.

evidence of our senses. And so well satisfied are the Newtonians, of the utter insufficiency of all their elaborate arguments and boasted experiments to produce a direct and manifest proof, or any proof at all, to invalidate the divine assertion, that they are constrained to declare, that "were it not for the fixed stars, it would be *extremely difficult, if not impossible,* to prove the motion of the earth. We should suppose that the planets made a complete revolution between any two similar situations with respect to the sun, because the places of elongation are similarly described, and are in quantity the same, whether the earth be in motion or not. It is from the *apparent* motion of the sun with respect to the fixed stars, that we *conclude* that the earth describes an orbit in about three hundred and sixty-five days." Posterity will, I believe, read with astonishment, that the men of this age, by looking at the *sun in motion,* supposed it to *stand still!* As there is no *appearance,* even according to their own admission, and consequently no *proof,* of the earth's motion; why not draw the natural and obvious conclusion, that the sun really describes the orbit which he appears to do? That, however, would not suit their purpose, and therefore they go on to assert, that "the strongest objection that can be made against the earth's motion round the sun, is, that in opposite points of the earth's orbit, its axis, which always keeps a parallel direction, would point to different fixed stars, which is not found to be the fact. But this objection is *easily* removed *by considering*" (not *by experiment,*) "the immense distance of the fixed stars, in respect of the diameter of the earth's orbit, the *latter* being no more than *a point* when compared with the former." Thus they *consider* a thing as they *would have it,* and then they *positively assert that it is so!*

In order to make this objection, respecting the poles, go down "*easily*," it is necessary to believe, that although two opposite points of the earth constantly coincide, to a single second, with two opposite points in the heaven: (which points, are not perpendicular to the plane of the supposed orbit of the earth, but to the centre of the plane of the equinoctial;) I say, that, notwithstanding the well-known fact that these *four points*, the celestial and terrestrial poles, are, according to the nicest observations made with the most perfect instruments, *immutably fixed in the same right line*; we are required to believe, or be stigmatized "the worst of heretics," that the globe moves one hundred and forty one times faster than a ball shot from the mouth of a cannon unperceived by us on its surface! Further, we are required to believe, that in December, we are about 200,000,000 of miles from the place we left in June, though we cannot possibly discover, by the most exact observation of the polar star, that we have moved one inch!

This unchangeable coincidence of the poles of the world is so decisive a proof that the earth does not move, that, in order to set it aside, it was necessary for the masters of the Newtonian school to astound and overwhelm the understandings of their disciples with an assertion which, in the whole annals of romance, was perhaps never outdone. O, say they, it is *easy* to *remove* this objection, "because from *what we know* of the immense distance of the fixed stars the *nearest* of them is 32,000,000,000,000 of miles, which is *further than a cannon ball would fly in seven millions of years!*" Reader, look at this fine row of figures and reflect upon the assertion! That amazing stretch was no doubt intended as a finishing stroke to the hint given by

the great Dr. Wallis about one hundred and sixty years ago. Noticing the "parallax of the earth's annual orbit to prove the Copernican system; if," says he, "it *can* be observed, it *proves* the *affirmative;* but if it *cannot* be observed it doth *not prove* the *negative*, but only proves that the semidiameter of the earth's epicycle is so *small*" (95,000,000 of miles!) "as not to make any sensible parallax." You will perceive, reader, by this, that the Doctor was pre-determined to receive evidence *only in support* of the Copernican hypothesis, but *not a word against it;* otherwise I conceive that it would have been more consistent with fairness and candour to have expressed himself to this effect. "If it can be discovered that the declinations of what are termed the *fixed stars*, are manifestly different in June from what they are in December, such difference may be received as an argument in favourof the Copernican system; but if, by the most diligent and careful observations made with the best instruments, not the smallest difference can at any time possibly be discovered, it may then be fairly inferred that the earth is firmly and perpetually at rest.

Now the result of all observations made to ascertain this point has been, that the declinations of the fixed stars are every day in the year the same to a hair's breadth; (for the change in one year by the precession of the equinoxes cannot be discerned,) and therefore in order to render nugatory the evidence which so fully confirms the revealed system in Genesis, the followers of Newton are called upon to credit the enormous tale, that a cannon ball with its greatest velocity, if that velocity were continued for seven millions of years, would not reach the nearest of the fixed stars!!!

Oh how these philosophers have tortured their imaginations and exercised their ingenuity to invent plausi-

bilities to support their system! Mr. Romer and Mr. Huygens pretended to calculate the motion of light reflected from the small stars which move along with the planet Jupiter, in order to render the idea of an annual motion a little feasible: but Mr. Cassini and Mr. Miraldi after examining the hypothesis, by a great number of observations, expressed an opinion that those philosophers were completely mistaken. What Mr. Bradley wrote about the motion and aberration of light was of about equal importance and merited just the same attention, as is evident from Dr. Maskelyne's remarks upon the uncertainty attending such nice observations; for, when he attempted to ascertain the parallax of Sirius with a ten feet sector, he found, by the friction of the plummet line upon the pin, by which it was suspended, that an error of ten to thirty seconds could not well be avoided. Upon the whole then it is abundantly evident, that no annual parallax has ever been discovered; and that therefore there exists not even the shadow of a proof, that the sun is stationary and the earth in rapid motion.

He who revealed his own system has not left his people to doubtful aberrations or uncertain glimmerings of light, but has illustrated and confirmed his account with such decisive clearness, and by such infallible proofs, as will I trust in time to come effectually defend it against the sophisms of the academics; the petty experiments of mathematical mechanics; or the deceptive mediums of opticians; for, with the manifestations of his boundless power, he has, on certain memorable occasions been pleased to combine such demonstrations of his moral and natural truths, as ought to secure the credit of his system against the misrepresentations of careless ignorance or the vain manœuvres of insidious opposition. The people heard from the top of Sinai

divinely articulated a re-authentication of the history of the creation: they afterwards saw and heard Joshua divinely empowered to stop the *sun* (not the *earth*,) and moon in their courses. And if further proofs of that system were necessary for the confirmation of it, there was one in the reign of King Hezekiah completely decisive. The shadow upon the dial* went back ten degrees; "so *returned the sun* ten degrees by which it had *gone down*." So it is literally expressed by the man who was commissioned by the Creator to give, in fact, a lecture upon the grand orrery of the universe! The Hebrew people saw these things, and for that reason they have believed and taught a knowledge of them to their children, from generation to generation. Their astronomical system was indeed the only one deserving of adoption, for it possessed accuracy of description conjoined with the corroborating proofs of experimental action.

The records in the sacred books, and the evidence of the senses, have proved most troublesome obstacles to that class of philosophers, who have so laboriously exerted themselves to establish a system, which, in all points, absolutely contradicts both, and which requires the evidence of both to be dismissed, as false and deceptive. To accomplish that object, the sceptical philosophers have been aided by the countenance, and even by the labours of the clergy. So early as the days of St. Augustine, the clergy seem to have been rather remiss and defective in their defence of the divine account of the celestial motions: on a question being started in his time, amongst his flock, concerning the motion of the heaven, "whether it be fixed or moved?"

* If other proofs were entirely wanting, I think, it might, be fairly inferred, that as the Jews understood the construction of dials, they must have had a knowledge of the true figure of the earth.

He replied, "These points require many subtile and profound reasons for the making out whether they be really so or no; the undertaking and discussing of which is neither consistent with my leisure nor their duty, whom I desire to instruct in the necessary matters more directly conducing to their salvation, and to the *benefit of the holy church.**" One might suppose, that neither the *benefit of the holy church*, nor the *people's salvation*, would have suffered by instructing them, and confirming in their minds a belief of the revealed history of creation, and other divine declarations concerning the true motions of the heavenly bodies. The Rev. Dr. Derham, as if apologizing for the penmen of the holy scriptures not expressing the doctrines taught by the Newtonians, assures his readers, that "the design of the holy scriptures is not to instruct men in philosophical, but divine matters; that they speak of things according to *appearance* and the *vulgar notion*, and the opinion which men have of them, not according to *reality*, or philosophical *verity*." Now, I would seriously ask all the reverend ministers of religion, who have imbibed and supported this view of those venerable monuments of historical information, "IF THE FOUNDATIONS BE DESTROYED, WHAT CAN THE RIGHTEOUS DO?" If He, who of his own free-will gave existence to man, instead of instructing us and correcting our erroneous and corrupt notions, ordered his servants, to deceive us in natural and visible

* Cardinal Baronius treated the matter in terms still shorter, "The intention of the Holy Ghost," says he, "is to *teach* us *how we shall go to heaven*, and not *how heaven goeth*." The Cardinal, it seems, was not aware that many would despise and reject such *teaching*, under an impression, (industriously and falsely produced by philosophers,) that the Bible gave an erroneous account of *natural* phenomena, and therefore was not to be regarded in spiritual matters.

things, who shall vouch for those that are spiritual and invisible? If he has allowed us to be deceived in his account of created things, so likewise he may have done in spiritual things—the scripture draws no distinction. Joshua said, in the sight of Israel, "*Sun* stand thou still, in the direction of Gibeon, and the *Sun stood still.*" "And he (Jesus) arose and *rebuked the wind*, and said unto the sea, peace, *be still!* And the *wind ceased*, and there was *a great calm.*" Now, in both of these ever memorable instances, the respective historians have taken care to inform us, in the most clear and express terms, that there was an exact agreement between the words spoken and the effects which instantly followed. Therefore if the one be false the other is also.

The same Dr. Derham, with some others, affects to think it probable, that the miracle, in the case of Joshua, "was *effected* by *means* of some *preternatural refractions*, or *extraordinary meteors!*" Why this shuffling—why pretend to believe the miracle at all? I certainly can conceive no just reason, why God, or Joshua, should exercise any juggling or cheating in the accomplishment of the wonderful event. Why should there be a disagreement between the word and its immediate effect; between His truth and His power? If, until that moment, the eyes of the people had misinformed and deceived their understandings, respecting the true celestial motions, how easy was it for Him, who had created both, *then* to inform their ignorance! But, philosophers will judge in their own way upon these matters. They arrogate to themselves the privilege of calling in question all things, both divine and human:—the truth of God must, forsooth, give way to the establishment of their system, as the true worship, in ancient times, did to the false worship of various idols of the

imagination; not because their system is of the least benefit to the world,—for nothing that is false can be so;—but because they imagine that their fame, as learned men, or their interest, as authors, is identified with it. These insidious sappers of the foundation, are, in my estimation, far more culpable than the writer whom I first quoted; for, although he has thrown off the mask, and openly, without reserve, attacked the whole divine fabrick, he has done it upon the ground, and with the weapons, prepared by his sophistical predecessors.

This celebrated passage of Joshua, which is so clearly expressed in a few words, has given philosophers a vast deal of trouble. If they could have erased it from the Bible I believe, they would, have done it long ago: they have attacked, explained, and commented upon it, in so many ways, that if their observations were collected together, they would fill a large volume. The passage, however, remains in its native force, and is in itself a host against their system. John Kepler, the astrologer, who was mathematician to the Emperor Rudolf; on finding that his calculations would neither fit the works nor the word of God, followed the bent of his own crooked mind, and determined to warp them both to his own views. It was he who, in imagination, first changed the planetary courses, from the true line of regularity and beauty, to his own distorted plan; but in carrying on the false construction of his system, he found himself confronted and opposed in his progress by the astronomical event in Joshua; and, in his spleen, he appears to have been determined to give the passage a more violent twist, than even he had previously done to the celestial orbits. "Incogitant persons," says he, "only look upon the contrariety of the words; *the sun stood still;* that is, *the earth stood still;* not considering

that this *contradiction* is confined within the limits of the optics and astronomy: for which cause it is not outwardly exposed to the notice and use of men: *nor will they understand* that the *only thing* Joshua *prayed for,* was *that the mountains would not intercept the sun from him,* which request he expressed in words that suited with his ocular sense."* Such is the commentary of the famous Kepler! It in some degree justifies the observation of one of his eulogists, who asserts, that, "by his own talents and industry, he has made *discoveries,* of which no traces are to be found in all the annals of antiquity." No doubt this is an instance in proof of his wonderful talent for *discovery!* Let any one compare it with the passage in the tenth chapter of Joshua, and be convinced. But Galileo says, that "whenever the *world's system* is in *dispute,* it is *necessary* to *gloss* and interpret *the words of the text in Joshua.*" Quite as *necessary* as it was some centuries ago to gloss and remove the Bible out of the way, when the popish *system* was first in *dispute!* Thus it is that the whole scripture is attempted to be made void; by the philosophers in *naturals,* and by the religionists in *spirituals:* but it is above a match for them both, because sense and reason will for ever stand up in support of it. Its light exposes the delusive philosophical jurisdiction of Galileo and Newton, as much as it condemns the false spiritual jurisdiction of the Pope. God will, in due time, be acknowledged as faithful in the *description* of his works and in the operations of them, as in the *dispensations* of his judgments and of his mercy.

I might here add many other curious glosses upon this celebrated passage, as well as on the one concerning the

* But he refers his readers to the tenth chapter of his optics for more particular *refutation* of the tenth chapter of Joshua!

dial of Ahaz, from Augustine, Abulensis, Cajetan, Galileo, Magaglianus, Fantoni, and a great number of others amongst Cartesians and Newtonians: but on these points, as on other things, they writhe, twist, and contradict each other; generally, however, concluding with Cardinal Baronius, "that the intention of the Holy Ghost, is to teach us how we shall go to heaven, and *not how heaven goeth!*" There is, however, one of these unmerciful commentators whose exposition it may not be amiss to notice, on account of the conspicuous part which he acted in the establishment of the solar system.

About the time that Newton, in Oxfordshire, was systematizing Pythagoras's mathematical principles of gravity, Bishop Wilkins,* in support of the solar system, was labouring, in Chester, to explain away the truth of all opposing passages of scripture. His work on that subject is elaborate and curious as the spider's web;—like that it has caught many weak flutterers about the temple of knowledge, but it can no more withstand the force of truth, than the web can obstruct the flight of the eagle. Adverting to the miracle aforesaid, in the acts of Joshua, the Bishop asserts, that, in certain cases, the Holy Ghost doth *conform himself* unto the *false appearance* of things and our *grosser conceit.*" No wonder that scepticism increases and spreads, when such indecent libels on the sacred records are promulgated and taught by Bishops and Priests. The reverse however is the fact: it has ever been the intent of divine revelation to unmask *false appearances* and to correct our *grosser conceits.* For, says the Holy One of Israel, to his erring people; "*my thoughts* are not as *your thoughts*, nor *my ways* as *your ways.*" He has frequently condescended to teach the humble knowledge, but never

* Who was one of the first members of the Royal Society.

made any communication by his servants that could even have the least tendency to countenance, much less to confirm, his people in error by adopting the language of either their ignorance or of their folly. *So the Sun stood still in the* MIDST *of heaven;* says the scripture; (Joshua x. 13.) upon which the Bishop remarks, "Now to speak *properly*, and as the thing is in itself, *heaven has no midst but the centre;* and therefore *this also* must be interpreted in reference *to the opinion of the vulgar.*" Well then, is it fair to infer, from the introduction of the word, *midst*, that the rest of the account is the reverse of what is expressed? Are we to believe, because it is said, "the Lord overthrew the Egyptians in the *midst* of the sea," that they were not so overthrown? Very curious arguments these, to be used against the divine system of the celestial motions. Even on the supposition, that the event took place when the sun passed the *meridian*, the appearance would justify the expression made use of by Joshua. But he seemed determined by all means to invalidate the record of Joshua. Upon this part of it, "And there was no day like that before it or after it," he remarks, that those words were "not to be understood *absolutely*, for there are always *longer days at the poles*, but in respect to the opinion of the *vulgar*, that is, there was never any day *so long* which these *ignorant people knew of.*" No, nor that the *wise philosophers knew of;* the expression is perfectly correct, for whether to the inhabitants of Judea, or the polar regions, the day would be lengthened by so much time as the sun was stationary in its course: all the people on the globe, who had then the sun above their horizon, would experience a lengthened day, while all the rest would find a lengthened night; so that the expression of Joshua is, in a scientific view, *absolutely* correct—*there was no day like that before*

*or after it.* Therefore the *vulgarity* and *ignorance,* which he charges upon Joshua and his companions, falls entirely to his own share. The *constant tutor* of Joshua was that Divine Being who gave to man an intelligent soul; of course it is reasonable to believe, that under His instruction, though he might be ignorant of the dogmas of the philosophers, in other respects he was not so stupid and ignorant as the Bishop imagined him to be. Let those who are of his opinion read the elegant eulogium of Joshua's character drawn by the son of Sirac, and confute it if they can.

The said Bishop then proceeds to his explication of the passage respecting the returning of the sun in King Hezekiah's time. "I think," says he, "it may probably be affirmed, that it is to be understood only concerning its *shadow,* which against its nature *did seem* to go backward, when as the *sun itself* was not in the least manner altered *from its usual course.* The reasons for it may be these. First, the miracle is proposed *only concerning the shadow;* wilt thou that the *shadow* shall ascend or return by ten degrees? There being not in the *offer* of the wonder, *any* the least *mention* made *concerning the sun's going backward.*" What a tissue of sophistry and contradiction is here! It was the shadow which *seemed* (how reluctant!) to go backward, and *not the sun.* This is one of those absurdities which these philosophers require their followers to believe, however contrary it may be to the known course of nature. If the *dial* remained stationary, how could the *shadow* move backward without a *corresponding motion of the sun?* The return of both in coincidence was certainly wonderful, but the return of the shadow *alone* would have been infinitely more astonishing. Yet the Bishop would have it so; he would even rather believe in the possibility of an

effect produced without its natural cause, than that his own darling system should be touched. "The miracle," says he, "is proposed only concerning the *shadow*, there being not in the offer of the wonder the *least mention* made concerning the *sun's* going backward." Very true, the *sun* was not named in the *offer* of the wonder; but the Holy Spirit, foreseeing the insidious perversion of sceptics, took care, on the *accomplishment* of the miracle, to have the fact expressly mentioned in these words, "So the *sun returned* ten degrees, by which degrees *it had gone down.*" It is impossible for words to be more precisely descriptive of action; there is not the least ambiguity of expression for the most dexterous disputant to exercise his ingenuity upon. The Bishop, nevertheless, expected his readers to believe his opinion, in preference to the historical account of Isaiah, who was an eye-witness, and actually engaged in the operation of the amazing event. "This sign," says the Bishop, "*did not appear in the sun;*" to prove which, he makes use of a very extraordinary argument; "because" says he, "in II. Chron. xxxii. 31. 'tis said, that the ambassadors of the King of Babylon did come unto Hezekiah to enquire of the wonder that was done in the land; and therefore it seems the miracle did not consist in any change of the heavens. If it had been in the sun, it would have been as well discerned in other parts of the world, as in the land of Judea, and then what need the King of Babylon send thither to enquire after it?" The Bishop here takes it for granted, that the wonder, concerning which the ambassadors came to enquire, was that respecting the shadow on the dial, though there is no clear ground for that supposition, either in the Second Book of Kings, or in the Book of Isaiah, where the account of the miracle is recorded.

In those books it is merely stated, that the King of Babylon had sent his ambassadors with letters and present, on hearing that Hezekiah had been sick and was recovered. Alluding to the mission of those ambassadors in the Second Book of Chronicles, where the acts of that worthy King are recorded, the account closes with these words; "Howbeit in the business of the ambassadors of the Prince of Babylon, who sent unto him to enquire of the wonder that was done in the land, God left him to try him," &c. But nothing is said there, or any where else, concerning the nature of the wonder that they came to enquire about; therefore it is as reasonable to suppose, that they came to enquire about, and to congratulate him upon, the event of the miraculous cure he had received, as for the purpose of enquiring into the fact of the sun being brought back in its course. But I will admit, for the sake of argument, that the latter is the fact principally alluded to;—how does this prove, that the "miracle did not consist in any change in the heavens," or that the Babylonians had not seen the retrograde motion of the sun? If they had not observed the wonderful appearance, or been very credibly informed of it, I cannot believe that so powerful a prince would have sent ambassadors to enquire about the strange motion of a *shadow!* The Chaldeans were astrologers, and of course very diligent and exact observers of the motions of the heavenly bodies: and if, as may be inferred from the account, the event happened when the sun was nearly setting, a retrograde motion of ten degrees, such as we estimate them, could scarcely have escaped their notice. We may, then, reasonably conceive, that they did witness this great phenomenon, and while they were in doubt and perplexity, concerning what could be the meaning of it,

probably news arrived, that it was a sign which the Creator of the sun had been pleased to give to a pious and excellent prince in token of his regard, to assure him of his recovery from a dangerous disease: under such circumstances, and having perhaps heard of other great manifestations of divine power and mercy to the Hebrews, in times past, it would be very natural that the King and Princes of Babylon should be desirous of enquiring concerning "the wonder that was done in the land," and therefore, according to the eastern custom, he sent ambassadors with letters of congratulation, accompanied by suitable presents. I suppose they would have an opportunity of conversing with the Hebrew astronomers; for it appears that they were treated with great hospitality and distinction, and were shown every thing that was curious and valuable in the kingdom. This is my view of the matter, but let every one consider and judge of it as it appears most reasonable to himself.

The Bishop asks, "Why have we no mention made of it in the writings of the ancients? It is no way likely that so great a miracle as this was, if it were in the sun, should have been passed over in silence." I answer,—the account in the sacred history appears to be honestly related; and if we profess to believe it to be the book of truth, why require confirmations from the historians of idolatrous nations, whose books are acknowledged to be stuffed with lies and fabulous romances? But there is a very sufficient reason, why many wonderful passages in the Hebrew history are not corroborated by other ancient historians; which is, because the principal events of the Hebrew annals had taken place long before even the time of Herodotus of Halicarnassus, whom Cicero calls the father of history. It is however very worthy of

remark, that that writer, after mentioning the flight of Senacherib, relates, that the sun had, in times past, inverted his course and *risen* in the *west four times*. Now, the sacred historian, immediately after ending his relation of the flight and destruction of Senacherib, mentions the sun to have inverted his course and risen *once* in the *west;* for, as it is said to have "gone down," it must of course have appeared to some nations, situated east of Judea, to rise up in the west by the space mentioned, namely, ten degrees: but the Bishop was so extremely reluctant to admit any testimony that might seem to make against his favourite argument, that because the account in Herodotus states the sun to have had the said inverted motion *four times* in ten thousand three hundred and forty years, he says it cannot be urged "as pertinent to the present business." He might, however, have recollected how very prone the Chaldeans, Egyptians and Greeks, are said to have been to exaggerate every thing concerning their antiquities, and to swell days or months into years.*

* In a discourse which Bishop Wilkins wrote about one hundred and sixty years ago, by which he laboured to prove that the earth was a planet, about seventy or eighty pages are filled for the purpose of persuading his readers, that as, in his opinion, the Hebrews were a rude and illiterate people, God, by his messengers, condescended to use such expressions as flattered and confirmed them in their erroneous and stupid notions concerning natural phenomena. To prove which, he makes numerous quotations from, and allusions to, the bible, and elaborately comments upon them, for the express purpose of showing, that such passages were intended to mean the very reverse of what is expressed; or that they are directly opposed by philosophical truths. Did the limit which I have prescribed to my present undertaking allow me to go into an examination of all his fallacies and sophisms, I believe I could easily refute them, but it does not: And, besides, I should be trifling with my reader's time and patience, were I to enter upon a grave exposure of all the flimsy inanities upon which such a writer thinks proper to exercise his ingenuity for the purpose of decoying his unwary readers from the

Those Hebrew lexicographers, who have adopted the solar system, have, in order to reconcile it with the said

wholesome habits of exercising common sense and common understanding. As a further specimen, however, of the treatment the sacred books meet with, from both clergy and laity of this sect of philosophers, I shall quote another passage from the Bishop's book, and offer a few remarks upon it, though not directly apposite to the present branch of my investigation.

"Thus likewise because the common people actually think the rain to proceed from some waters in the expansum, therefore doth Moses, in reference to this erroneous conceit tell us of waters above the firmament, and the *windows* of heaven, of which, saith Calvin, such men too servilely tie themselves unto the letter of the text, who hence conclude there is *a sea in heaven;* when as we know Moses and the prophets, to accommodate themselves unto ruder people, do use a vulgar expression, and therefore it would be a preposterous course to reduce their phrases unto the *exact rules of philosophy.*"

The question is not whether the scriptures teach us *exact rules of philosophy;* but whether the Maker of the Universe has, in describing his own works, truly informed us of what we should otherwise have remained in ignorance? I believe he has, and that all that is necessary for man to know respecting the creation and disposition of the four elements of earth, water, fire and air, is truly revealed to us in Genesis. I have examined the different human systems and I cannot find any thing, either in the motions of the heavenly bodies, or in the general form of the universe, in the least at variance with the account which God has revealed and ordered to be recorded for the information and instruction of all ages and all nations.

With regard to the extraordinary passage just quoted, I positively deny that the author of the account of the creation ever countenanced an idea of rain proceeding from the water above the firmament, but on the contrary expressly mentions the true origin and formation of it. As little does the sacred author give reason to conclude, that *there is a sea in the heaven*, but the very reverse; nor is there such an idea revealed in the scriptures, as, *windows of heaven.*

In the second chapter of Genesis, after having in the first related the order in which all things were created, the author returns to certain particulars, and gives a more detailed account of them; and as if to prevent erroneous notions being entertained respecting the source of rain, he expresses himself in part of the fifth and following verses in these words "Every herb of the field *before it grew*, for the Lord God had not caused it to rain upon the earth,

passages of scripture, gone another way to work. They profess to have lately discovered what the whole Jewish

and there was not a man to till the ground; but *there went up a mist from the earth and watered the whole face of the ground.*" The same doctrine is confirmed by succeeding divine writers. David says "He causeth the *vapours to ascend*," &c. And Job, more particularly "*According* to the *vapour* the clouds *drop* and *distil* upon man *abundantly*." The ascent of vapour being generally invisible, I believe that even philosophers themselves could not truly have accounted for the derivation of rain, had it not been revealed by Him who formed it: instead, however, of acknowledging the source of their information they have not only omitted to notice these passages, but have wilfully and ungenerously endeavoured to pervert and misrepresent the matter altogether.

But although rain is ordinarily produced by the ascent of vapour, there is a particular instance mentioned, in Noah's history of the deluge, of its descent, on that awful occasion, from the stellar reservoirs, which were formed out of that division of the water, which, at the creation, we are told, ascended above the firmament. The translators of the seventh and eighth chapters of Genesis, by a singular mistake, have rendered the word *arubeth*, "*windows*." "And the *windows* of heaven were *opened*." The English word *orb*, is, I think, evidently derived from the Hebrew word *arube:* and therefore if *orbs* were substituted for *windows*, the sense would be good, and, in that instance, there would no longer be any tenable ground for the objection of the sceptics, who are far more gratified by the discovery of a single inadvertent fault, than by the inexhaustible stores of truth which fill the sacred volume. The word *arube* seems to have a particular reference to an *orb*, or light of heaven: and the word *chelon* to *window* or *lattice*. Therefore, the passage in question, I am of opinion ought to be read, "And the *orbs* of heaven were *opened*." Meaning the icy shells or bodies of the stars. I have read that the Chinese, who are said to be descended from a colony of Egyptians, are even now of opinion, that the stars occasionally dissolve in rain. And that the Arabians have, at this day, an old tradition, that one of the antideluvian kings of Egypt was forewarned of the universal deluge, by dreaming that the stars descended to the earth, and overwhelmed every thing by their force; which I merely notice for the purpose of shewing, that there were, in these nations, some indistinct traces of the true knowledge respecting the substance of the stars, and the manner in which they contributed to produce the universal deluge. However, I leave this point for the decision of the learned, being myself no

nation were completely ignorant of; namely, that the Hebrew words *shemesh* and *jerich* are not expressive of the solar and lunar *orbs*, but of the *light flowing from them*. So that, according to these very curious critics, we are not to interpret Joshua's words, "Sun (*shemesh*,) stand or rest over Gibeon, and thou Moon, (*jerich*,) in the direction of the valley of Ajalon;" but we are to understand, or express it thus, *Solar stream, or flux of light, remain thou equable or even upon Gibeon, &c.!*"* And, according to the same rule, we are not to read (Deut. iv. 19.) "And lest thou lift up thine eyes to heaven, and when thou seest the Sun, (*shemesh*,) and the Moon, (*jerich*,) shouldest be driven to worship them," &c.; but we are to express it thus; "and when thou seest the solar and lunar *fluxes* or *streams of light*, shouldest be driven to worship *them*," &c. This *discovery*, I think, is worthy to be classed with that other notable one of a learned Doctor, who some time ago published an opinion, grounded upon the Hebrew term, that it was not a *serpent* but a *monkey*, or an *orang-outang*, that was the instrument employed in the temptation of Eve! About thirty years ago, a mulatto boy, on his first arrival from the coast of Africa, was placed under my care. The first or second evening after his arrival he happened to go out of the house into the yard; and on seeing the moon shining brightly in the firmament, he, apparently with the most profound reverence, fell prostrate before it. I was informed by the gentleman, who

critic in the Hebrew language; I have merely stated my opinion. With regard to the idea, of *a sea in the heaven*, the ninth and tenth verses of the first chapter of Genesis, teach the exact reverse, namely, that the sea was formed by the collection of waters *under the firmament*.

* See Parkhurst's Hebrew Lexicon.

had brought him over, that the moon was an object of worship in the part of Africa from which he came. It was the lunar *orb* which caught his attention, and not the *fluxes of reflected light!* The learned in all ages, excepting latterly under the solar system, have, I believe, understood the terms in question, as signifying, simply, the *bodies* of the two great luminaries, as they appear to us in the heaven. *Bethshemesh* was one of the idolatrous cities possessed by the children of Israel on their entrance into the promised land; and its name was perhaps derived from the object of the people's adoration—the *house, palace,* or *temple* of the *sun.* Probably a similar observation may be applicable to *Jericho,* as being derived from the moon.

Though I have extended my remarks upon the laws of motion and attraction, with the illustrations connected with them, considerably farther than I intended, there are still a few points which my undertaking requires to be noticed, because they are objects from which philosophers pretend to infer, analogically, that the earth is in motion. They boldly assert, that they have found a confirmation of it in certain stars, which they say are evidently of an oblate form; but who shall decide the point when astronomers and opticians disagree? "This figure," says Dr. Derham, "they *imagine* is in Jupiter, his polar being to his equatorial diameter, as thirty-nine, three-fifths is to forty, three-fifths," (how wonderfully exact!) "but whether it be so or no, I confess *I could never perceive,* although I have often viewed that planet through very good and long telescopes, particularly a very good one, *of seventy-two feet,* in my hands; and although by reason of cloudy weather, and at present Jupiter's proximity to the sun, I have not been of late able to take a review of that planet, yet

Saturn, so far as his ring would admit, and Mars, appear *perfectly round* through Mr. Huygens' *long glass of one hundred and twenty-six feet.*" But, what is rather surprising, Dr. Herschell, some years ago, laid before the Royal Society an account, accompanied by a drawing, which represents Saturn as having the appearance of a square, or cube, rounded at the corners! So that with respect to the planets, the world, notwithstanding the force of the centrifugal motion, and the wonders of the telescope, is left in a state of complete uncertainty, as to whether they are flatted, oval, cubic, or round! However, in conformity to the theory of the motion of the earth, and in support of it, they *imagine* the planets to be flatted, and so the majority believe and teach. They observe them moving in their courses, and also turning round, (at least *so they say*, though the moon, which is plainly seen, never turns the same side from us,) therefore they conclude that the *earth* moves!

I have now, I hope, sufficiently considered the fundamental dogmas of the theory of gravity, together with the experiments of the string and ball; the rod and hoop; the spindle and soft clay; the mop; and lastly the millstone and pebble; and the application of them in the construction and support of that wonderful scheme. What are the effects of their powerful attractions and their whirling forces? They gravely tell us, that they are constantly altering our days and nights, and our winters and summers; that they will finally deprive us of the change of the seasons; that they increase the quantity of earth upon our globe; produce constant perturbations and disorders among innumerable worlds; forming them into irregular groups; flattening them by

the centrifugal force, to the form of millstones; drowning them or burning them up; interrupting each other in their courses, and dashing one another to atoms; worlds producing suns, and suns producing worlds; with numerous other operations, all calculated to excite wonder and terror amongst their credulous believers. But, unfortunately for the credit of these astonishing offsprings of philosophical imaginations, the annals of the world have never proved the actual occurrence of one of them. This objection, to be sure, is provided for, in the tranquillising information, that one of these accidents or changes, may happen in "some *thousands* of *ages!*" I acknowledge, indeed, that such direful consequences might be very reasonably expected to result from a system built upon the wild principles of Sir Isaac Newton, but most assuredly can never proceed from that divine order of things, visibly unfolded to us in the beautiful and magnificent structure of the universe; which, on being finished, and its parts separately, as well as collectively, surveyed, was declared, by the Almighty Creator, to be VERY GOOD—the work of infinite WISDOM! "*Jehovah by* WISDOM *hath founded the earth*; *by* UNDERSTANDING *hath established the heavens.*" Prov. iii. 19.

I am amazed that this most extraordinary delusion—this opprobrium to reason—has maintained its ground so long. Animal magnetism, which was in some respects a type of it, very soon met its fate.

Mesmer, and his pupils, taught that magnetism was an universal fluid, diffused through all nature, and the medium of all influence between the celestial bodies, and between the earth and animal bodies. That there was in nature but one disease and one cure, and animal magnetism was that cure.

The Newtonian school teaches, that attraction is a *something* that runs through all nature, so subtile, that it penetrates the inmost recesses of all matter in the sun and planets; that it is the cause and guardian of all their perpetual motions; and that it not only produces irregularities amongst them, but likewise at the same time exerts its wonderful powers to correct those disorders. In some respects its operations very far transcend those of magnetism, for, according to the creed of its believers, it creates and it destroys. Its operation one way neutralises its operation in another way—it is something, any thing, nothing:—it is the physiological Proteus of philosophers!

Compared with the reign of Newton's hypothesis, the empire of animal magnetism was of short duration; principally owing to two very sufficient reasons; for some time it spread rapidly, and was very favourably received, and might probably have continued in vogue to the present time, had it not unluckily interfered with the interests of a large and respectable body of men—the physicians. Their jealousy was awakened, and being joined by the philosophers, they made a formidable and successful attack upon it: for, unlike the system of gravitation, it had no mathematical veil to cover it; it was easy of access; its supporters were therefore soon defeated, and, as a natural consequence, their baseless fabrick was immediately exploded.

The chimera, gravity, on the contrary, being employed in the celestial region, has little to do with the sublunary interests of mankind, excepting so far as it is made use of to benefit the speculative and mechanical geniuses, who have profited by the temporary distinction to which they have been raised, by exciting the wonder of their admirers and patrons. On these accounts the

thing has generally remained unmolested, as well as by reason of its being elaborately fortified by a curious species of mathematical reasoning, which has rendered it unassailable, not only to the great mass of the people, but also to the mathematicians themselves, unless attacked in the very foundation. In fine, it altogether exhibits a wonderful perversion of reason. Like the pagans of old, who ascribed to their gods the gross passions and infirmities of weak mortals, our modern philosophers have, with equal folly, impiously laboured to place the unsearchable wisdom of the Creator upon a level with the grovelling notions of vain mathematicians, and the petty operations of spinning mechanics. "To whom will ye liken me, saith Jehovah? my thoughts are not as your thoughts; neither your ways as my ways: for, as the heavens are higher than the earth, so are my ways higher than your ways, and my thoughts than your thoughts." *Isaiah.*

# CHAPTER VIII.

## THE THEORIES OF THE ATMOSPHERE, AND VOID SPACES FOR PLANETARY MOTION REFUTED BY DECISIVE FACTS;—THE ACTUAL STATE OF THE OCEAN AN IRRESISTIBLE PROOF AGAINST THE THEORIES OF THE ATMOSPHERE, GRAVITY, AND EARTHLY MOTION.

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While arranging the elementary materials of the Copernican System, it occurred to the framers of it, that air, such as we breathe upon the surface of the earth, if co-extensive with the planetary orbits, would most effectually prevent the machine from going; that their imaginary worlds flying through it, with the incredible velocities ascribed to them, would experience such a mighty resistance, as would inevitably sweep every thing from their surfaces; or rather shiver them to pieces, and disperse them as dust. They therefore found it necessary to assert, that, what is termed the atmosphere, extended no more than about forty-five miles from the surface of the globe; and that the earth carries it about, comparatively, as a man carries his coat. That beyond this airy coat is what Sir Isaac Newton called the ætherial regions—a perfect vacuum, or what amounts to nearly the same thing, through which the earth, without experiencing any sensible resistance, moves with its atmosphere one hundred and forty one times more rapidly than a cannon ball! and of course, that whether drops of water, or air balloons, be floating

about in it, they are carried forward with the same velocity as the point of a solid rock!

To invent such plausible reasons as would give currency to this extraordinary hypothesis was a point of paramount importance; and they accordingly produced the delusive experiments of the barometer to show that the air gravitated, and that it decreased in density according to the increase of distance from the surface of the earth, by a certain mathematical ratio: so that according to Newton's calculation a globe containing an inch of such air as we breathe on the surface of the earth, if rarified to what he pretends to *demonstrate it to be* at the distance of four thousand miles above our heads, it would fill all the planetary regions of the solar system, as far as Saturn at least! Here is a notable instance of this celebrated philosopher's expansive imagination: it proves what fine ideas the brain, with the aid of mathematics, can spin out, when exercised in the freaks of fancy. Upon similar principles of calculation M. Amontons, in a paper which he laid before the French Royal Academy, observed that air might be compressed so as to be rendered heavier than gold, or platina; and imagined that the centre of the earth contained a sphere of about six thousand, four hundred and fifty-one fathoms of air compressed to a density superior to that of any known substance! He further imagined, that the earthquakes which occasionally convulse the globe are caused by air so compressed, being occasionally expanded by the heat of subterraneous fires! Such speculations as these are reckoned wonderfully sublime and profound; and if a man attempt to reason against them, our intolerant philosophers immediately cry out, that he is insane and that he ought to be cloathed in a strait jacket! I shall however risk the imputation and consider the subject

apart from their theoretical expansions and compressions, as its effects appear in the operations of nature.

Philosophers almost unvaryingly confound the elasticity, or spring of the air, with its weight, and accordingly conclude, that a base of an inch square supports a column of air of fifteen pounds weight; and by the same rule a middle-sized man is constantly pressed by about fifteen tons of air! Now if that be true, how is it that a man exists when, by mounting aloft in a balloon, until the barometer falls to ten or twelve inches, the pressure upon him, according to that rule, is suddenly reduced two-thirds, or about ten tons? When Mr. Robertson ascended at .Hamburgh, a few years ago, it does not appear that he bursted or even experienced any inconvenience whatever, from that cause, although the quicksilver in his barometer sunk as low as twelve inches and a half. Mr. Baldwin, too, when he ascended from Chester, in the year 1785, expressly mentions, that he experienced no inconvenience whatever; nor did Mr. Brydone when on the summit of Etna; the French on the Andes; or Dr. Heberden on the peak of Teneriffe. Others I admit are said to have experienced some difficulty of breathing when placed in elevated situations; but what does that prove? Not an increase of rarity, but the reverse. Dr. Fletcher, formerly an English envoy at the court of Russia, states, that when you there pass out of a warm room into a cold one, you will "sensibly feel your breath to wax stark and even stifling with the cold as you draw it in and out." The same sensation is mentioned by the French philosophers as felt by them at Tornea; in breathing they said their breasts seemed to be rent. The experience of every one proves that breathing is more difficult in frosty weather, when the density of the air is increased by cold, than in warm weather when it is rarified by heat.

I consider air to be a simple, homogeneous fluid, created quite distinct from water or any other substance;* and formed into a body as expressed in the sixth and seventh verses of the first chapter of Genesis, for the purpose of continuing the motions of inanimate bodies in the heaven, and to preserve and promote the existence and growth of animal and vegetable bodies on the earth; to give articulation to sounds; to enable us to sail upon the ocean and for other beneficial purposes. I consider that its pressure, apart from motion, is equal in all directions; that it gravitates no more downwards than it does upwards: and that all the changes that are observed in the state of its pressure, are caused by the increase, or decrease, of motion, heat, or the weight of earthy or watery substances which float in it near the surface of the globe. Mr. Bruce when at Yambo, Jidda, and Loheia, on the coast of the Red Sea, found the quicksilver in the barometer three to five inches lower than it

* My opinion of the atmosphere is supported by that of William Jones, F. R. S. in his phisiological disquisitions, which I have perused since writing the above; he states as follows.

"The various parts which enter into this compound fluid of the atmosphere, have perplexed the subject to such a degree with those who have undertaken to study the nature of the air, that some have supposed the nature of the air to be nothing but water rarified, others nothing but salt of some kind in another form. Thus we might dispute about wine, beer and spirits, till we had lost sight of the element of water; but here we are in less danger, because water is a grosser fluid, and more obvious in its simple form. When all other parts are removed which enter into the composition of the atmosphere, *there certainly remains a fluid*, which is the *vehicle* and *substratum of them all:* in so much that if there were neither earth, nor salt, nor oil, nor sulphur, nor water, still there would be that air, which gives motion to the lungs and is the spring of animal life. *This simple fluid* is the first object of enquiry to those who consider the nature of the air; and the properties of air, which arise from the mixture of other things with it, are to be regarded rather as accidents than properties."

is generally found in England; and in particular at Jidda, which is nearly on a level with the surface of the Red Sea, it stood at the same height as it does upon the top of the mountain of Snowdon in Wales, which is estimated at one thousand two hundred yards above the level of the sea. Now I am of opinion that so great a difference in the pressure of the air, in those two situations, must be entirely owing to the difference of the climates: the atmosphere of the former being dry, and that of Wales, on the contrary, humid: the air in the latter part being loaded with watery particles, of course gives it a greater pressure downwards. Boerhaave, I think, is of opinion, that the gravity of the air depends entirely upon the water and other substances floating in it.

At the point to which Mr. Robertson ascended it appears, that about three-fifths of the pressure upon the barometer was by some cause taken off: a Newtonian will ask, how could so great a change have happened, if the air was there increased in density? I think, it is easily accounted for. At that elevation both the humidity and warmth were greatly diminished. The elasticity of air is much increased by the operation of heat upon the water mixed with it, as is plainly evident in the cylinder of a fire engine. Mr. Robertson says he could obtain little or no signs of electricity;—little or no *heat* to warm and increase the spring of the air;* it was, therefore, comparatively torpid, but it does not follow that it was less dense. If not less dense, the same philosophers will ask, why then does not the balloon continue to rise above a certain elevation? I reply, for the same reasons that vapours cannot rise above a certain height.

* "It does not appear that there is a single experiment to evince any elasticity in air, independent of fire." *Jones's Physiological Disq.*

Like a warm bubble in water, it is forced upward while it has a humid atmosphere to pass through, and also until its included warm air cools, and then it begins to descend.

But although the air in elevated regions, for the reasons I have mentioned, does not possess the elastic force that it does near the surface, it is not on that account the less dense; on the contrary, it is more buoyant, as are oil, quicksilver, &c. when in a freezing state; though I do not suppose, with Fourcroy and Lavoisier, that the absence of fire would change it from a fluid to a solid consistency. It is owing to the strength of its buoyancy that it is capable of sustaining such immense collections of water, in a fluid as well as in a congealed state. This appears to have been the philosophy of the ancients upon that point. "He binds up the waters," (says Job,) "in his thick clouds, and the cloud is not rent under them."—"By his great power," (says the son of Sirac,) he maketh the clouds firm, and the hailstones are broken small." In this state the buoyant air, in spite of the Newtonian gravity, supports them, until the fire, or electric fluid, as it is termed, by rarifying, or shaking the air in which clouds are formed and suspended, sets their contents at liberty to fall to the ground. "In the month of June," says Dr. Wallace, in his account of Orkney, "after great thunder, there fell flakes of ice nearly a foot thick." Many such accounts are on record. Those vast collections of water, suspended in the air, which at times suddenly burst over places and sweep every moveable thing before them, could not possibly be supported and carried along by thin air, such as we breathe. For philosophers to assert such a thing is extremely absurd; it looks something like imposition; and to believe it, must be bigotted credulity. Wonder-

ful is the supension of clouds! "Give ear to this," (says God to the philosophic Job,) "stand still and consider the wonders of God. Dost thou know the balancings of the thick clouds, the wonderful things of him who is perfect in knowledge?"

Philosophers labour to explain these phenomena in different ways: one of which is, that air and water are reciprocally transformed into each other, by the agency and operation of electricity! But will they assert, that air is transformed into cinders and stones, or that they can produce any such substances lighter than air? If they cannot, how will they account for volcanic stones and cinders being carried seven hundred miles by air, which they contend is far more rarified than that which we breathe? Ammianus Marcellinus, a Greek historian, affirms, that cinders, from an eruption of Vesuvius, were carried as far as Constantinople. Kircher likewise relates, that, from a volcanic eruption from the sea, near the island of Thesa, in the Archipelago, multitudes of pumice, and other stones, were likewise carried to Constantinople, and to other places at a great distance. Other similar facts might be adduced; but I suppose these are sufficient to prove, that the air upwards does not diminish in density according to modern theory; but, on the contrary, its buoyancy a few miles above the earth, either from its own nature, or from the limited operation of attraction, is sufficiently powerful to support bodies in motion, without the imaginary aid of centrifugal and centripetal laws. In this view I am, in some measure, supported by the opinion of Lord Bacon, who in his Sylva Sylvarum observes, that "the interstellar sky, though the opinion be vain, that the star is the denser part of his orb, hath, notwithstanding, so much affinity

with the star, that there is a rotation of that as well as the star."*

From all these considerations, and many others equally obvious, I conclude, that Newton's doctrine of an unresisting medium for his worlds to fly through, ought to be exploded; because unsupported by reason, scripture, the opinions of wise men, or the experimental operations of nature itself.†

* I am, however, of opinion, that air is buoyant by the rapidity of its motion, as well as by the density of its nature. We know, by experience, that a high wind will carry substances a considerable distance, which, in a calm, would instantly fall to the earth.

† Mr. O'Gallagher, though a supporter of the *Solar System*, was evidently no convert to the fictitious expedients which the Newtonians have employed in the *establishment* of that system. He says, page 91,

"It would not here be an impertinent enquiry to ask, why the *vis inertiæ* of matter has been rendered so universal by those very philosophers, who make the active power of attraction equally general? Or why they are so tenacious of that torpid property, which seems inconsistent with the operations of nature? The *vis inertiæ* of matter, according to these philosophers, implies a sluggish force therein, which resists motion. This resistance, they say, is in proportion to the quantity of matter, or to the *vis inertiæ* of what stands in the way or passage of the moving body; whence we are to understand, that where motion is perpetual, there can be no resistance, *i. e.* according to this doctrine, no matter, but a *perfect vacuum*. Hence we see that the *vis inertiæ* of matter seems to induce the *necessity* of a *vacuum* in the planetary spaces; that property is therefore the greatest support of the reigning system, and should be obstinately defended by all who undertake to maintain a *vacuum*. But this tenet is as *contrary to our knowledge and experience in nature*, as the *inertness upon which it is founded*, is inconsistent with her operations. For the body of an animal is not a vacuum, yet the circulation of its blood, and other fluids, is constant and regular. A vacuum is not necessary in the sea, to facilitate the motions of fishes and ships; on the contrary, this fluid is to both a vehicle; nor could birds or clouds move in the air, without a corresponding vehicle. Should not the *planets, therefore*, according to Newton's second rule of philosophising, to wit, that like effects should have like causes, *have some medium, or vehicle for their motions*? Would not such a medium be more analagous to the

The moderns, having found it convenient to adopt the Greek opinion of Posidonius, respecting the height of the air above the earth, were at no loss, in their usual way, to find a plausible mathematical theory, to give weight and consistency to that opinion; but, like almost every other part of the system, it is delusive—it will not stand the test of close examination. The supporters of that old theory, seem not to have duly

other works and motions of nature; and also more consistent with infinite Power and Wisdom, than a *vacuum?* If philosophers can thus depart from analogy, by what means shall they come to the knowledge of things that are beyond the reach of their senses and experience? By what rules shall they erect a system of physics? If analogy, grounded on experience, is not attended to, according to that fourth rule which Newton established, in order to exclude conclusions arising from *hypotheses*, and *to admit none but those founded on experiment*, their systems must be in a great measure *ideal and imaginary.* Doubtless then the necessity must have been insurmountably great, which has thus obliged them to step aside from the *known course of nature;* and to depart so far from the scientific train of analogy, as to lose sight of the principles and vehicles of motion they had, and have in constant and universal experience. This necessity seems to have proceeded from the admission of some principle which is *probably as erroneous, as its consequences are false. This principle* can be no other than *gravity*, which is held forth as the *primum mobile* of nature, or the chief agent which carries on and preserves the planetary motions. Gravity is defined the power and force, &c. by which bodies near the earth tend to its centre, and planets to the sun. Some say it is a universal property of matter, but Newton declares he does not take it for an essential property. Some persons will have it *peculiar to matter*, and yet will have it act with full force *in vacuo;* almost all agree in making it the course of nature's operations; yet no one has determined its particular residence, adequate substance, or peculiar essence; but when they are urged for its particular nature and residence, they give the universal salvo, that God made it, that, according to His divine ordinance, it obtains in nature, and is the cause of her motions. Thus, *contrary* to our axioms, which were deduced from principles grounded on the works of the Omnipotent Creator, and which are quite conformable to infinite wisdom; *material effects and operations are admitted without a material cause or agent, a power without an adequate principle, and an essence without its proper substance.*"

considered the reflection of light from one mass of vapour to another; had they done so, they would have found, that an elevation of humid vapour, (which is that which reflects the light,) to the height of two or three miles, is quite sufficient to account for the appearance of day-break an hour, or an hour and a half before sun-rising. Let L represent the centre of the earth;* GFDB a part of its surface; and ACEI the upper part of the atmosphere, or the greatest elevation to which vapour ascends: at the moment of day-break the sun is said to be about eighteen degrees below the horizon; equal, in these latitudes, to about 650 miles on the surface of the earth. But the quantity of the angle must greatly vary according to the latitudes, and to the sun's declination; suppose the mean, however to be 18°, and the greatest rise of the vapour to be three miles, then supposing the semidiameter of the globe to be 3600 geographical miles, what would be the distance of a mass of vapour, at that elevation, in the eastern point of the horizon from another mass at the same elevation in the western point of the horizon?

| | | |
|---|---|---|
| As LC | 3603 - - - - - - | 3.556664 |
| Is to radius | - - - - - - | 10. |
| So is LB | 3600 - - - - - - | 3.556302 |
| To LCB | 87° 39′ 59″. - - - | 9.999638 |

which deducted from 90° there remains 2° 20′ 1″ for the angle BLC. The side C B is found as follows:

| | | |
|---|---|---|
| As LCB | 87° 39′ 59″. - - - | 9.999638 |
| Is to LB | 3600 - - - - - - | 3.556302 |
| So is BLC | 2° 20′ 1″. - - - | 8.609785 |
| To CB | - - - - - 147 miles | 2.166449 |

* See Plate, figure I.

which doubled, is 294 miles—the distance required: and supposing the first appearance of day-break to be produced by three reflections, namely, from A, (where the vapour receives the sun's direct rays) to C; from C to E; and from E to I; these three distances added together, make 882 miles—about 20° of longitude on the parallel of 45°. Geographers are not agreed, whether the first appearance of day-break be when the sun is 16°, 18°, or 20°, below the horizon; it depends, as I have said, upon the latitude and declination. This may serve to give some idea of the degrees of light reflected at the same moment to persons stationed at the points B, D, F, and G, in a westerly direction, two hundred and ninety-four miles from each other, which must be exactly the same as to an observer at B, when viewing the eastern point of the horizon, at three intervals of about half an hour each, more or less, (according to the latitude of the place,) from day-break to a few minutes before sun-rising. This is nearly the same view which I had of this subject about seventeen years ago, as expressed in my reply to Mr. Banks; since that time I have seen Varonius's Geography, and find that my solution of this problem differs very little from the one contained in the thirty-eighth proposition of his nineteenth chapter. I do not, however, agree with him, that the rays of light are reflected from *particles of air*, but from *water* floating in the air.

Having now considered the theories of motion, gravitation, and the atmosphere, I must candidly own, that it required a genius far above the common standard to give apparent coherence and form to these discordant materials; and I am induced to believe, that no man then in existence, except Newton, could have accomplished the work so effectually; or so successfully deluded the

credulity of so many millions of people into an implicit belief of its reality and truth: nor could he alone, eminent as he was for mathematical knowledge, have given currency to such a system of extravagant conceptions had he not been favoured by circumstances: but it was adopted in the college, recommended from the professor's chair, and broached at a period when the learned were peculiarly addicted to the pursuits of abstract reasoning. There is, however, one point so glaringly defective, that it is really surprising how the most heedless of his believers could have passed it over without detection. After having laboured hard, for about one hundred and forty years, to balance and compact the elementary parts of the system, they have been so astonishingly remiss, as to leave the ocean to the uncontrolled operation of three mighty forces, which would, in the first hour of the earth's motion, have completely swept it out of its bed, had not the Creator wisely ordered the matter otherwise.

These philosophers, in general, utterly contemn all miracles, excepting such as are necessary to keep their own delusive system from explosion. I have, I hope sufficiently proved that Newton's idea of a vacuum is an unfounded conceit; that on the contrary the space, even from the earth to the shining masses of frozen water called fixed stars, is filled with a body of strong buoyant air termed the firmament; in which, according to the first chapter of Genesis, God in the beginning placed the luminaries of heaven: now those who have witnessed the effects of a storm of wind upon the ocean, which wind, even in a hurricane, is not supposed to move with a velocity greater than one hundred and forty miles in an hour, may easily conceive what would be the consequence to the ocean if the earth moved through the firma-

ment at the rate imagined by the Newtonians, namely, 68,000 miles an hour—500 times quicker than a hurricane! Surely nothing but a miracle, far greater than the one mentioned in Joshua, about which they are so extremely squeamish, could in such a case prevent every drop of water, with every other light and moveable thing, from being swept off from the face of the earth.

But, if in the face of all evidence to the contrary, both human and divine, we were to admit Newton's doctrine of void spaces for planetary motion; that admission, even supposing it to be well grounded, would by no means secure the ocean from the effects of their own centrifugal and projectile forces. Let us now compare them with the motion and force of gravity, and see how far they will balance in the scales of their system. The force which, according to Newton, causes a body, (suppose a bladder filled with water) near the surface of the earth, to fall about sixteen feet in one second of time, is that which presses the ocean to its bed—that is the force of gravity. Now the power operating with that specific force upon the ocean, supposing the earth to move, is exactly *crossed* by another force on the equator above ninety times greater, namely the centrifugal, or rotatory motion of the earth, said to be upwards of 1500 feet in a second. Were the two forces equally balanced, the thing might appear plausible and go down tolerably well; but as the matter is represented, nothing but a great miracle could prevent the water from flying off the surface of the earth, as it does off a potter's wheel, the moment the centrifugal motion of that wheel overbalances the gravity of the water lying upon its surface. But that is not all; we have still to notice the projectile force of the globe, which is calcu-

lated at 100,000 feet in a second; that is, 6000 times the force that presses the ocean to its bed, as aforesaid; which inconceivable velocity would, in eight minutes of time, completely separate the globe from the ocean; comparatively as a shallow plate, if filled with water, would, by a quick horizontal motion, instantly be emptied of its contents and leave them behind. Yet under all the supposed influences of these powerful forces, operating in various directions, the ocean does not afford a single evidence of their actual existence:— the reason is sufficiently evident; like the wonders of Gulliver, they exist no where but in imagination and upon paper.

The Solar System could never have obtained currency, had not Galileo, or some such genius, succeeded in establishing the extraordinary belief, that the globe in its rapid motion carries along with it the circumambient air. The second dialogue, in his system of the world, (in which his theory of motion is discussed,) is the most elaborate part of his performance, and, taking it altogether, it certainly is a most extraordinary tissue of sophistry. The parts assigned to his imaginary companions in debate, Simplicius and Sagredus, are drawn up with considerable art. Plato, in his dialogue between Protagoras the sophist and Socrates, brings off simplicity and truth victorious. Here, however, Simplicius, though supported by nature and truth, appears to make but a feeble resistance; while the false colourings of Sagredus are so managed as to give plausibility to Salviatus's (Galileo's) sophistry, comparatively as base foil, used by jewellers, gives to worthless substances the appearance of precious stones.

He must be a very weak Simplicius indeed, who could be brought to believe, that a ball, (shot upwards from a

cannon erected perpendicularly,) under the influence of three contrary and very powerful forces, could ever regain the point from which it was projected; namely, first, the force of gravity said to be sixteen feet in a second; secondly the force of the earth's vertiginous motion, 1500 feet in a second; and thirdly the force of the annual motion, about 100,000 feet in the same space of time. But Galileo had a short way of getting over such objections, by asserting, that all these motions were *natural* to the ball in common with the earth! And that the only thing to be considered, was the force communicated by the powder which was not natural to the ball! Were he now living he would no doubt apply similar arguments to the motion of a balloon;—that it is perfectly *natural* for a balloon, though detached a mile from the earth, to be carried round, according to the diurnal motion, 1042 miles an hour; while at the same time, it is carried in a different direction at the rate of 68,000 miles an hour!

Galileo weakly imagined, that on land all the air above its surface, and below the tops of the mountains, was made to partake of the earth's diurnal motion by the ruggedness of its surface, and by the water and other matter hanging in it; but on the ocean between the tropics he said it was otherwise; there he contended, that the trade winds blowing from the east furnished a proof of the daily motion of the earth in a contrary direction.

Simplicius however very naturally remarked, that it *equally* proved the converse of the proposition, namely the daily motion of the heaven. But it proves neither the one nor the other, for, the monsoons in the East Indies which blow about six months in an easterly direction, and the other six months in a westerly direction,

exactly balance or neutralize the argument. Had he stated this fact, it would have spoiled his fine theory, and therefore he did not think proper to introduce it into the discussion. It must be admitted, that the Newtonian theory of the atmosphere, is far more plausible than Galileo's.

# CHAPTER IX.

**SCIENCE OF OPTICS KNOWN MANY HUNDRED YEARS ANTERIOR TO THE TIME OF GALILEO, THOUGH NOT EMPLOYED TO DISCOVER EARTHS IN HEAVEN;—NEWTONIAN MAXIMS OVERTURNED BY THE OBSERVATIONS OF MR. BALDWIN IN HIS AERIAL VOYAGE FROM CHESTER, BY THE DARK NATURE OF EARTHLY BODIES, AND BY THE EVIDENCE EXHIBITED IN THE STARS.**

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It is the boast of those philosophers who proclaim the glory of the Solar System, that its millions of worlds have been revealed to them principally through the telescope, and that the want of such an instrument kept the ancients in almost total ignorance of the true system of the world. The moderns as if forgetful, that the elements of all useful knowledge, of every good and perfect gift, were primarily derived from the Creator himself, seem constantly anxious to depreciate the knowledge and the skill of the ancients, as if to make room for their own exaltation and praise.

The mathematical sceptics, and some of the sceptical poets who imbibed their doctrines, seem to have formed an impious league, for the purpose of alienating the minds of men from the Great First Cause. Some of them have manifested their views in tolerably plain terms; others more obscurely; and they have, at last, succeeded in raising doubts, in the minds of many, as to whether we ought any longer to consider Him as the Creator of the Universe; the Mover of it; the Moral Governor of the nations; or, the Divine Instructor of

man. The world, which He has abundantly proved, by His revelations, and by His providence, to be under His own peculiar care, is now represented as being a mere insignificant point in the universe; and it is intimated, that mankind have, by some means, been placed upon it, and left to labour and grope their way in the dark as well as they can. In the scale of animal existence, they even place man below the brutes and the reptiles. That elegant, but most insidious, piece of sophistry, the *Essay on Man*, has, amongst other things equally remarkable, the following passage.

"See him from *nature* rising *slow to art;*
To *copy instinct* then was *reason's* part:
Thus *then* to man the *voice of nature spake,*
Go, *from the creatures* thy *instruction* take;
Learn *from the birds* what *food* the *thickets yield;*
Learn *from the beasts* the *physic* of *the field;*
Thy arts of *building* from the *bee* receive;
Learn of the *mole* to *plough*, the *worm* to *weave;*
Learn of the *little nautilus* to *sail;*"—&c.
GREAT NATURE spake; observant man *obey'd,*
Cities were built; societies were made.—&c."

To comment at large upon this farrago of falsehood, would be time lost. He ought, however, to have sent man to the *hog* for knowledge in *ploughing*, and to the *mole* for knowledge in *mining;* to the *spider* for information in *weaving*, and to the *worm* for instruction how to *spin*. This revelation of Pope is in direct contradiction to the revelations of God. For, according to the former, man, in his primitive state, was sent to school to the beasts, fowls, vermin, insects, and fishes, for the purpose of learning the arts of civilization; that man was the only creature placed upon the earth in a destitute and forlorn condition; even him, concerning whom it

it was said, "Thou hast made him a little lower than the angels, and hast crowned him with glory and honor. Thou madest him to have dominion over the works of thy hands; thou hast put all things under his feet." The philosophers would draw him entirely away from a knowledge of his high origin, and of his glorious destination; and, like the syrens of Homer, they incessantly labour to allure him from a state of safety on the ocean of truth, and to draw him to certain destruction on the rocks and the shoals of their own delusive sophistry. Let him once lose the knowledge of his high estate: let him believe in the oracles of Pope; go for knowledge to his university of brutes; look to his Moloch, who, he assures us, in direct contradiction to the gospel,

——— sees with *equal eye*, as God of all,
A *hero perish*, or a *sparrow fall*;

and he will then become ready food for the devouring sword, or a fit instrument for the most flagitious crimes. He will be estimated according to his physical powers and his capabilities for destruction. Their false philosophy, in process of time, if not checked in its progress, will actually reduce him to a state even below the condition of the untutored savage in the wilderness; for *he*, under all the disadvantages of his state, continues to retain *some* knowledge of the existence and providence of his Creator: The true philosopher knows, and will always bear in mind, that God was not only the author of his being, but likewise the source from which he derived the rudiments of all those arts which are necessary for the comfort, preservation, and even for the embellishments of society. The very nature, and actual condition of human society at the present time, evidently prove it; and this most important truth is completely confirmed by divine history from the beginning to the

conclusion. I now proceed from this short digression, to the subject with which I commenced this chapter.

Mr. Waller, the publisher of Dr. Hook's works, which he dedicated to Sir Isaac Newton in a particular essay, expressed his opinion, that "the ancients were wholly ignorant of refracting burning-glasses, except spheres, and therefore that it was no strange thing that they had neither telescopes nor microscopes, both which noble inventions have discovered * new worlds to the last and present age." Another writer, alluding to Archimedes's burning glasses, goes so far as to assert, that "it must be absurd to pretend, that the ancients had the knowledge of compound burning-glasses, such as consist of pieces of plain looking-glass put together in the manner of the one invented by Mr. Buffon; for this supposes, that they had not only the art of making large concave speculums; but also, that they understood the art of making and foliating looking-glasses, nothing of which appears from history, or is worthy the belief of any judicious person."

That the ancients never carried the art of making optical glasses, or telescopes, to a pitch of improvement equal to that of the moderns, is, I believe, perfectly true; but it does not thence follow, that they were entirely ignorant of the nature and use of such instruments. A greater demand, and of course more extensive practice, have rendered the moderns more perfect in this line than the ancients were. The ancients, for example, excelled in sculpture, because, as they worshipped the works of their own hands, the craft was esteemed honorable, and excited great emulation, under the idea, that the names of the artists would, with the images and temples which contained them, continue to be the admiration and praise of

* The merit of this *discovery* certainly belonged to the Greeks: Diogenes Laertius states that Anaxagoras held, that the moon was covered with hills, vales, and water, and was inhabited.

future ages, and give a sort of immortality to their fame. In a plurality of images, exquisitely formed, they then as fervently contemplated a plurality of gods, as the Newtonians in these days, when viewing through their long tubes the crystalline bodies in the heavens, firmly believe, that they are really beholding a plurality of worlds. They fancy, or pretend to fancy, that they discover upon those luminous bodies, mountains, seas, clouds, snow, lightning, smoke, volcanic fires, and, at times, in the case of Jupiter, the conflagration of whole continents! They, however, do not affirm, that they have discovered plants and animals, but, on the contrary, very gravely express an opinion, that instruments cannot possibly be brought to such a degree of perfection!

Now, it is worth while to enquire, what are the *apparent* dimensions of the body upon which our astronomers profess to survey tremendous volcanoes? The diameter of the moon occupies an angle equal to a third of an inch placed one yard from the eye. How far it would be possible to survey burning mountains, (suppose such existed in the moon,) upon a surface of that extent, however swelled by deceptive optics, I leave every thoughtful enquirer to judge. Suppose the glass to magnify a thousand times, the diameter would then appear to be about twelve inches. Suppose then this twelve inches to be the miniature of a body of about 2200 miles in diameter; the forty thousandth part of an inch, at a yard's distance, would, in such case, be a space representing a volcano of one mile in diameter, at the supposed distance of 240,000 miles! But it is by no means inconsistent for those mathematicians, who write about *motion* in a *point*, to assert, that their optics enable them to discover volcanic appearances upon a surface of a forty thousandth part of an inch, placed one yard from

the eye! I conclude that such appearances are only to be seen, as one of them shrewdly remarks, "by the prying eyes of an astronomer."

When it is considered what an extensive and lucrative branch of trade is carried on in the manufacture of telescopes, principally owing to the diligent search made by the curious after worlds of wonders in the sky, it is not surprising that the moderns excel the ancients in the dimensions and perfection of optical glasses; but in the event of men becoming convinced, as I expect they will, that the planets are only congelations of water, much money and time will, in that case, no doubt be saved, and, I hope, be applied to purposes of greater benefit and utility to the public: and the artisans employed in that trade, will, I trust, be able to transfer their ingenuity to objects equally advantageous to themselves, and of far greater importance to the community at large.

I must, however, remark, that the ancients were not quite so ignorant of optical glasses as the modern philosophers seem disposed to represent. The assertion of the writer, which I have quoted, denies that the ancients had a knowledge of the construction of burning glasses, or the art of making looking-glasses, does not appear to be founded on truth. Besides, what history relates of the burning reflectors of Archimedes; it is affirmed by one Anthemius, an architect, who wrote in the days of the Emperor Justinian, that the great mathematician, Proclus, destroyed the fleet of Vitellius, when at the siege of Constantinople, by a compound burning-glass, or reflector, and he particularly describes the instrument. It is also recorded, that by similar means, the Emperor Leo, about the year 709, burned part of the Saracen fleet.

Concerning the article, glass, Pliny says, "Some of it with the blast of the mouth is fashioned into what form the workman pleases. Other parcels polished with the turner's instrument; and some again is engraven, chased, and embossed in manner of silver plates; in all which arts the Sidonians in times past were famous artificers; for at Sidon were devised mirrors or looking-glasses."

Nor were the ancients ignorant of refracting burning-glasses. Aristophanes, in the Comedy of the Clouds, in ridicule, represents Socrates examining Strepsides about the method he had discovered of getting clear of his debts, and, as saying, "I thought of making use of a burning-glass, which I had hitherto used in kindling my fire; for, should they bring a writ against me, I will immediately place my glass in the sun, at some little distance from the writ, and set it on fire."

Coming down a few centuries later, history mentions a certain character who could construct magnifying-glasses of considerable power, but for such a scandalous purpose, that I shall pass over his name. Our own countryman, Roger Bacon, (according to Dr. Plott, in his History of Oxfordshire,) wrote a book of perspective almost six hundred years ago, which proves, that the learned friar well understood most kinds of optical glasses; but there is one passage, in particular, which is so directly to the point, that I shall here insert it. "Greater things," says Bacon, "are performed *if the vision be refracted;* for it is easily made appear, that the *greatest things* may be *represented less,* and *little things* as *the greatest,* and that things *afar off* may be represented *near;* thus we can make the sun, moon, and stars, to all appearance, to come down as here below," &c. The next, in order of time, that I have met with, who notices this subject, is the book of Henry Cornelius

Agrippa, *On the Vanity of the Arts and Sciences*, published more than half a century anterior to Galileo's construction of telescopes. Adverting to optics, he observes, "This art much conduces to the understanding of the variety of celestial bodies, their distances, magnitudes," &c. He mentions, likewise, "experiments being daily made in the various kinds of glasses, hollow, convex, plain, pillar-fashioned, pyramidal, globular, gibbous, full of angles, inverted, everted, regular, irregular, solid, perspicuous, glasses to make little things appear great; things afar off, near; camera obscuras," &c.

The Neapolitan philosopher, John Baptista Porta, wrote a book expressly on optics and optical instruments, many years, I believe, before the pretended discoveries of either Jansen or Galileo. "A philosopher," says Porta, "must be skilled in optics, that he may know how the sight may be deceived; how to make one see that plainly which is a great way off; and how to throw fire very far from us." And in another place; "I call lenticulars, portions of circles *compacted together* of *concaves* and *convexes;* with a convex you shall see small things afar off very clearly; with a concave, things nearer to be greater, but more obscurely; if you know how to fit them both together, you shall see both afar off and near at hand, both greater and clearer." This writer treats the subject mathematically, and teaches how to grind burning-glasses of parabolic and other forms.

In the twelfth volume of the Biographical Dictionary, published in the year 1784, it is mentioned under the name PTOLEMY, that Mabillon, in his German Travels, exhibits a figure of Ptolemy looking at the stars through an optical tube, which effigy he said he found in a

manuscript of the thirteenth century, and was done by one Conradus, a monk. I may add, in addition to these historical notices, that Seneca, the Roman philosopher, used a microscope, such as some of our modern philosophers have used, namely, a small glass globe filled with water; therefore, I conclude, that a very small portion of the credit of inventing optical glasses belongs either to Jansen, the spectacle-maker, or to Galileo, the philosopher. The Copernicans have, however, greatly celebrated the praises of the latter, because he so largely contributed to establish their favourite creed, concerning the motion of the earth, and a plurality of worlds; and, in particular, because he displayed so much address in promoting the removal of any scruples that might have been felt, at forcing the Solar System upon the world, in defiance of inimical passages of the holy scriptures.

I have, now, sufficiently shown, that the ancients were not ignorant of optics, or optical instruments. However, I have no objection to admit, that the astronomers who flourished before the time of Galileo, never thought of availing themselves of such aids for the discovery of *earths* in the *heavens*. Indeed, I am well persuaded, that, in general, they well understood the difference between the obscure appearance of an opaque body, and the shining property of a transparent crystalline substance. Fontenelle, who was an enthusiast in the belief of a plurality of worlds, took considerable pains to persuade his female noviciate, that the moon was as certainly inhabited as the town of St. Denis; but the feigned marchioness very pertinently asks him, "Can it be possible that the earth is luminous like the moon, for that is essential to their similarity?" Conscious of the force of the remark, certain Newtonians

have imagined, that some very bright parts of the moon are rocks of diamonds! The moon and stars are, indeed, bodies evidently formed of a shining substance; which, by its transparent nature, admits the penetration of the solar rays, and returns them to the eye by reflection. It appears reasonable to suppose, that the moon is really of a watery substance, from the circumstance of the similarity of her appearance to white clouds, or snow-covered mountains, when, in the day-time, the three objects are seen in the same direction. The correctness of this conclusion seems to be further confirmed by Mr. Baldwin, in the narrative of his aerial excursion in the year 1785, but more particularly by a coloured print, accompanying that account, which shows how the earth appeared as seen through the openings between the clouds, when he was at a considerable elevation above them. The earth appeared of an obscure, greenish, or bluish hue, but the clouds were of a dazzling white. Moreover, instead of the water of the sea, rivers, ponds, and canals appearing dark, as Cassini, above a hundred years ago, said it would, to any one, if he were placed at a great elevation above it; on the contrary, it appeared to Mr. Baldwin to be bright and shining; the pits, he said, were like spangles upon a dark ground. I recollect seeing that balloon when it penetrated the clouds; it did not appear like a luminous star; but the very reverse; and I therefore infer, that a globe of earth, at the same, or any greater distance, would have had a similar dark appearance; or, rather, that at the distance of a few miles it would have totally disappeared, for want of the natural property of receiving and reflecting the beams of solar light.

The Newtonians implicitly relying upon their theory, and spurning at the vulgarity of all occular demonstra-

tion to the contrary, positively insist, that the moon is an opaque body. One of their most admired writers has in his book this passage. "Moses calls the moon a GREAT LUMINARY, as well as the sun, but the moon is known" (by whom, or by what means?) "to be an opaque body, and the smallest that astronomers have observed in the heavens," (of that, however, they have never yet given any proof, as will hereafter be shown,) "and shines upon us, not by any inherent light of its own, but by reflecting the light of the sun. If Moses *had known this*, and told the Israelites so, *they would have stared at him*, and considered him rather as *a madman*, than as a person commissioned by the Almighty to be their leader." As men possessed of discerning senses and intelligent understandings, they would most certainly have stared and considered him a madman, and they would of course have rejected him as a leader, had he attempted to persuade them that black was white,—that a globular body, opaque and naturally obscure, (for in general they *now* believe that it has neither atmosphere nor ocean,) would reflect light to the distance of 240,000 miles, of Newtonian measurement! For, as their minds, in those early times, were not darkened and sophisticated by false systems of philosophy, common experience, aided by common sense, must have convinced them to a certainty, that such a thing was impossible, and that therefore none but an ignorant man, or a presumptuous impostor, would insist upon things so preposterous. But had he on the contrary told them, that the moon was a congealed watery substance, and that it therefore possessed a capability of receiving and transmitting the solar beams by reflection, their understandings would immediately have assented to a thing so reasonable, because it was natural: nor could they justly have considered it an impropriety, to term the

moon a GREAT LUMINARY; for, as the moon derives its light from the sun, so, primarily, did the sun receive its light from the Creator. The one body dispenses the light; the other receives and reflects it back to the earth. I conceive air to be as necessary to support and give effect to the solar light, as water in the lunar, or in any other body, to receive, reflect, and render it manifest to the natural sight. It was to Moses that the Maker of the sun and moon, re-authenticated his own history of the creation; and, therefore, under His divine tuition, it may be supposed, that Moses knew the nature of dark and luminous bodies, quite as well as his opposers of the present day, notwithstanding all their elaborate bubble-blowing, fire-weighing, and pore-searching, of solid matter. They slyly, with one breath, acknowledge Moses to have been a leader and a lawgiver, raised up and instructed by God; and then, with the very next breath, because his information happens directly to oppose their impositions, they impudently contradict, and accuse him of a want of common sense!

But however conclusively the moon's crystalline appearance demonstrates the falsehood of the modern assertion, that she is formed of opaque matter, and inhabited; there is no great necessity to dwell upon that argument; for there are many others to prove, that it is *physically impossible* that either it, or the planets, can be inhabited; that is to say, if we may be allowed to enter upon the discussion, with reasons furnished from what we know of the operation of created things, and of what is absolutely necessary for the subsistence of animal life, and no other kind of arguments, in rational discussion ought for a moment to be tolerated.

Astronomers inform us, that upon the moon there is no change of seasons, by reason that her axis is conti-

ally perpendicular, or very nearly so, to the ecliptic; so it is with Jupiter and Mars. Now, experience tells us, that, without such vicissitudes, this globe would soon become a desolate waste. The sun shines on one side of the moon every month for a fortnight together, without any clouds to intercept his rays. Were that the case on the earth, there can be no doubt that, in all the torrid and temperate zones, at least, animal and vegetable life would very soon become extinct. For we know how oppressive the heat sometimes is, even in the northern climate of England, though relieved by the sun's nightly absence. During the other fortnight, one half of the moon lies in darkness and cold, which would be equally as destructive as the same period of heat. One half of the lunarians, they tell us, enjoy the constant presence of moon light, (earth light!) because the moon has always the same side towards us; but the other half of them, for the same reason, never see a moon, unless they now and then take a journey for the purpose of peeping at us! All the inhabitants of the earth, on the contrary, are served by the moon's regular periodical returns, without the necessity of travelling hundreds or thousands of miles to enjoy the spectacle, or the benefits derived from it. Here it is absolutely necessary, for the support of animal and vegetable life, to have the constant use of air and water; but on the moon, it is contended, by most philosophers, that there is no atmosphere, no clouds, seas, nor lakes; yet one and all of them agree, that she is an inhabited world, from the circumstance, I suppose, of her face being rough, and her body round!*

* Kepler wrote a book under the title of "An Astronomical Dream;" concerning *lunar astronomy*, or what things would happen to the inhabitants of the moon, what diversity of light and days they would experience," &c. What Kepler proposed as a *dream*,

Leaving the moon to the dreams of philosophers, let us turn our view to the extremities of the Solar System, and consider what there is in the situation or circumstances of Mercury, or of the Georgium Sidus, to recommend them to the rank of inhabited worlds. The former, we are assured, upon mathematical demonstration, has seven times more heat than the earth receives from the sun; of course nothing like vegetation or animal life could exist there, even at the poles; the salamander itself would quickly fall a prey to the devouring flames. If we consider the other extremity of the system, how intense must the cold be on the Georgium Sidus: what animal, or what plant, could exist in such a dark region of eternal frost? where the Newtonians assure us, that there is less solar light, and more cold, by 360 times, than we have upon this earth! Oh, say they, as to light, that planet has two or three attendant moons: well, and suppose it has; what benefit should we derive from our moon, supposing her light to

Huygens, and a long list of Kepler's Newtonian followers, have treated as a reality. *Parkhurst's Heb. Lex.*

The writings of Baron Swedenburg seem rather satirical upon this point. With apparent gravity he assures his readers, that he "conversed with the spirits of people who had formerly lived in the land of the moon; that they were homunciones, or dwarfs; that they appeared to him by two and two, riding one upon the back of the other, and that they had voices in imitation of thunder, which issued from their abdomen, (instead of lungs,) because the moon has no atmosphere!" He likewise asserts, that he conversed with the spirits of some beings who had formerly inhabited Jupiter, who were called chimney sweepers, and appeared in similar garments, but who were ultimately changed into caterpillars and butterflies! He mentions the other planets of the Solar System by name, and says he conversed with spirits from them all; but it ought to be remarked, that he does not enter upon any description, of, nor does he notice, the people of the Georgium Sidus, Hercules, Ceres, or Pallas! Was he forbidden to anticipate the discoveries of philosophers? Perhaps his followers can answer that.

be no more than the three hundred and sixtieth part of what it is? The more this preposterous system is considered, the more does it appear to be replete with sophisms, absurdities, and impossibilities. When, however, they find their untempered mortar insufficient to cement the parts of their miserable fabric, they immediately have recourse to the name of their Creator for assistance. "It is not necessary," say they, "that the inhabitants of Mercury, and the Georgium Sidus, should be of the same nature as those of this earth, the Almighty can fit them for the extremes of heat, cold, &c." No doubt He can do any thing that is consistent with the plans of His divine wisdom, but He never will realize the dreams of idle philosophers; for, most certainly, if the system were formed upon their wild principles, the heavens would no longer declare the glory of God, nor would the firmament exhibit everlasting proofs of his unbounded wisdom!

## CHAPTER X.

**DISTANCES OF THE HEAVENLY BODIES;—THE METHODS PROPOSED BY ASTRONOMERS TO ASCERTAIN THEM SHOWN TO BE INAPPLICABLE AND THEREFORE USELESS;—CONTRADICTORY ACCOUNTS OF PHILOSOPHERS RESPECTING THE DISTANCES OF JUPITER'S SATELLITES FROM HIS BODY, AND LIKEWISE RESPECTING THE DIURNAL REVOLUTIONS OF THE PLANETS;—THE CHARACTER GIVEN BY DIODORUS SICULUS OF THE GREEK PHILOSOPHERS STRICTLY APPLICABLE TO THE MODERN ONES;—NATURAL EVIDENCES OF THE DEITY STATED BY ST. PAUL, AND EXEMPLIFIED IN THE CONDUCT OF SOCRATES;—POETICAL CONCLUSION.**

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To calculate the destinies of individuals and empires; to discover the causes of motion in the heavenly bodies; or to measure the distances and magnitudes of the sun, moon and stars; have, in all nations from time immemorial been, to astronomers and mathematicians, objects of unceasing pursuit; though God, in the Holy Scriptures, has so pointedly set their vain efforts at defiance. "Let now the observers of the heavens, the lookers on the stars, stand up."—"My hand founded the earth, and my right hand spanned the heaven."—"Who among them has declared these things?" &c. But there is no occasion to multiply quotations, because the constant disagreement and war of opinions amongst philosophers, sufficiently prove that they are utterly ignorant of these

matters, and that all such attempts are impositions, unless they are grounded upon what God himself has been pleased to reveal.

The distance which Posidonius, Ptolemy and other ancient astronomers, assigned to the moon has, with some small variations, been adopted by the moderns; namely about 60 semidiameters of the earth; which is I think evidently founded upon the apparent dimensions of the earth's shadow in a lunar eclipse. Ptolemy and some others of the ancients seem to have had a tolerably correct idea of the magnitude of the earth, and as they, like the moderns, agreed in imagining the sun to move at the distance of many millions of miles, they likewise imagined, that the diameter of the conical shadow of the earth could not be much diminished at the moon; and that as the moon appeared to be about one-third the breadth of the shadow, they concluded that the moon itself must bear nearly a like proportion to the diameter of the earth, and that therefore the real diameter of the moon must be about 2200 miles. That this estimate is formed from the *appearance*, is evident from the mathematical *consideration*, that an object of a third of an inch in diameter placed one yard from the eye, or of 16 yards in diameter placed at the distance of a mile, appears equal to the diameter of the moon, which at the distance of 240,000 miles must be about 2200 miles in diameter in order to appear of an equal magnitude; on the supposition of its not being affected by the medium through which it is viewed. Though it is evidently upon this shadowy foundation that astronomers have estimated the distance and magnitude of the moon, they, I believe, generally, if not altogether, keep it out of sight, and endeavour to make their readers believe, that the problem may be solved by geometrical principles.

As they mostly copy from each other, it will be sufficient to quote what one or two of them have advanced upon the subject.

"We will begin with the moon; this planet is nearer to us than any of the rest, and the method of finding her distance from the earth being once known, it will be easy to perceive that the distance of an yother planet may be determined in nearly the same manner. The first thing to be done in the method I am about to describe is to find the moon's horizontal parallax, or the difference between the place of the moon when she appears in the horizon to a spectator on the earth's surface; and her place as it would appear to a spectator placed at the earth's centre. This problem is no less curious than the one it is meant to elucidate; it is the same thing as to find the angle under which the semidiameter of the earth would appear, at a certain time, to an observer placed at the centre of the moon. That this can be done, must appear *very extraordinary* to a person *unacquainted* with astronomical principles: but the determination, singular as it may seem, is *far from being impracticable.*"

"Let us suppose an observer to be placed upon any point A, of the equator BAC (Fig. 2,) at the time the moon moves in the equinoctial DMP, then as this latter circle is in the plane of the former the moon will pass directly over his head, and descend perpendicularly to the horizon EN. In this situation of the spectator upon the earth's surface A, the moon will appear to have described a quarter of a circle, or 90 degrees, in passing from the zenith M to the sensible horizon at N; but to a spectator placed at the centre of the earth O, she would appear to have described a quarter of a circle when she came to the rational horizon at P. But the moon revolves

round the earth, from the meridian to the meridian again, in about 24 hours and 48 minutes; she will therefore revolve from M to P in six hours and twelve minutes; and if the time she takes in moving from M to N, be found, by observation, and taken from six hours twelve minutes, the time of moving from M to P, the remainder will be the time employed in describing the arc NP.

"Having thus found the measure of the arc NP in time, we can convert it into degrees and minutes, as follows: as the time of describing the arc MN, which is found, by observation, is to 90 degrees, so is the time of describing the arc NP, to the degrees and minutes in that arc. But this arc is the measure of the angle NOP, or of its equal ONA; for, since the lines AN and OP are parallel to each other, it is a known property of geometry, that the angle NOP will be equal to the angle ONA. This angle ONA, is called the moon's horizontal parallax, and as that is now found, we can easily determine the distance of the moon from the earth's centre. For it is a maxim in trigonometry, that when any three things, in a plain triangle, are known, except the three angles, the rest may be found by calculation.

"Now, in the triangle AON, we have the side OA, equal to the diameter of the earth, which from an actual mensuration of *the circumference*," *(part*, only, of the circumference,) "has been found to be about 3960 miles: the angle ONA, or the moon's horizontal parallax, has also been found by observation; and the angle OAN is a right angle, because OA is perpendicular to the sensible horizon EN. These three things, therefore, are known, and are sufficient data for determining the rest. The side of the triangle ON, is the distance of the moon from the centre of the earth O; and this distance, by a

trigonometrical operation, is found to be, at a mean rate, about sixty semidiameters of the earth, or in round numbers, about 240,000."

This is one of those demonstrative supports of the Solar System which we are required to believe, or to be denounced by the oracles of it, as, "the worst of heretics." It has the merit, certainly, of appearing extremely plausible, and so far it suits their system; but that is all that can be said in its favour; in other respects it may, with propriety, be classed with the rest of their inapplicable experiments and fanciful theories.

The refraction of the air, concerning which philosophers are entirely in the dark, as their own writings show,* renders this mathematical theory quite useless: besides which, may be mentioned the difficulty of noting the exact time of the moon's passage through the zenith; the rapid change in her declination; the unavoidable inaccuracy of instruments and time-pieces, used in making observations, and even the liability, in nice observations of this kind, to be deceived by the eye itself. These are obstacles which no human art can surmount. Besides, the moon moves through an angular space equal to what they estimate the whole parallax to be, in less than four minutes of time: it may be further remarked too, that an observer elevated to the short distance of 969 yards above the level of the sea, would see the centre of the lunar disk until it reached the *rational* horizon, in which case she would seem to

* "It would be endless to notice the different opinions respecting both the terrestrial and the astronomic refractions which are to be met with in the writings of various authors on the subject; and it would be equally useless to notice all the tables of its quantity given by them, some of which differ very much from others."—*Dr. Rees's New Cylopædia, Article, Refraction.*

him to have no parallax. For, let *a* (Fig. 3,) represent the station of an observer on the earth's surface, at the level of the sea, viewing the moon while setting in the sensible horizon H; if the same observer were elevated to A; it is evident that he would then be enabled to see the centre of the moon until it reached S, the rational horizon. Suppose the moon's distance from the earth to be 239980 miles, the semidiameter of the earth 3985, and BSO, the angle of the moon's parallax, 57′ 5″; we have then the angle SAO, 89° 2′ 55″, and the angle SOA 90°. Let a line be drawn from the point B, where SA touches the surface of the earth, to O, the centre, And then the triangles SOA and OAB will be similar.

| | |
|---|---|
| As sin. SAO, $89^{\circ}\ 2'\ 55''$ - - - - - - | 9.999940 |
| Is to BO, 3985 - - - - - - - - - - | 3.600428 |
| So is Rad. - - - - - - - - - - - - - | 10.000000 |
| | 13.600428 |
| *Miles. Yards.* | |
| To AO 3985 969 - - - - - - - - - | 3.600488 |

So that an observer at A, elevated 969 yards above *a*, the level of the sea, would see the centre of the moon at S, in the *rational* horizon; and consequently it would appear to his view full six hours and twelve minutes, even without the elevating aid of refraction. But I need not enlarge upon the useless theory in question; the proposer himself was sufficiently aware of its inefficiency for the purpose; for he observes, "The true quantity of the moon's horizontal parallax cannot be ascertained by this method, on account of the varying declination of the moon, and the inconstancy of the horizontal refractions, which are perpetually changing, according to the state of the atmosphere at the time: for the moon continues but for a short time in the equinoc-

tial, and the refraction, at a mean rate, elevates her apparent place near the horizon *half* as much as her *parallax depresses it.*"

Here I may be allowed to ask, how do these philosophers know what quantity the parallax depresses the appearance, before that parallax has been discovered? "But," says the proposer of the above-stated theory, "astronomers have *thought* of" (not *practised,*) "another method, which is free from these objections; and if practised by able observers, with good instruments, it is sufficient for determining the parallax, and distance of the moon, to *a considerable degree of precision.* I shall mention the most simple case first, and this will render the general method more clear and satisfactory. Suppose two observers placed under the same meridian at A and B, (Fig. 4,) at such a distance from each other, that the one at A sees the moon M, in his horizon, whilst the other at B, sees her in his zenith; then will the distance of the moon OM, and the horizontal parallax OMA, be *easily* determined. For the arc AB, which measures the angle O, is equal to the difference of latitude of the two observers; the side OA is equal to 3960 miles, the same as before; and the angle OAM is a right angle, &c. This," he adds, "is the simplest solution the problem admits of; *but,* as it may not be *easy to perceive* how the two observers can be *placed in the manner required,* I shall give you a more general method," &c.

In this last solution, the author begins by asserting, that it is free from those objections which the first is liable to; one of which, he very properly remarked, was the horizontal refractions; surely that attaches to this second method, since one of the observers is supposed to see the moon in the horizon; however, it is not necessary to dwell upon this, since it is admitted

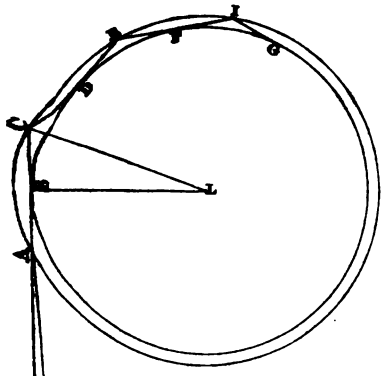


*Fig. 1*

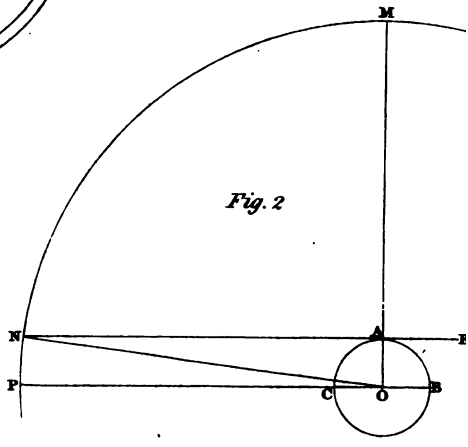


*Fig. 2*

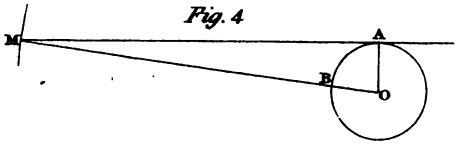


*Fig. 4*

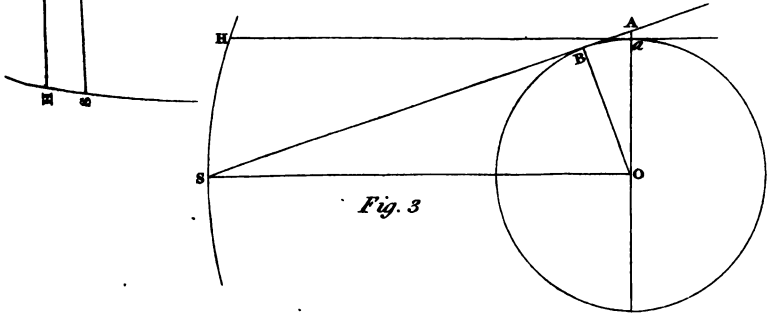


*Fig. 3*

that it is not "*easy* even to *perceive* how the observers can be placed in the manner required." It certainly is not easy to perceive how they could be so placed; and, even if the surface of the globe presented no obstacles, the method itself pre-supposes a knowledge of the moon's distance, and also the exact effect of the air's refraction. He then goes on to state the third general method, which is the same as the one recommended by Mr. Ferguson as the best; in this it is proposed, that one observer should be placed in the northern, and the other in the southern hemisphere, at a distance from each other of at least six or seven thousand miles! But, as it has never been put in practice, it would be a loss of time to enlarge upon it. Thus it is that these speculators delude their readers by specious and untried theories; and such seems to be the present state of the question among our modern astronomers, concerning the distance, and, consequently, the magnitude, of the moon.

It is astonishing that those who planned the expeditions to different parts of the earth, for the purpose of observing the transit of Venus, in order to have the sun's distance determined,—that *they* did not first think of requiring from astronomers a rational and true demonstration of the distance of the moon, which they say is not above the four hundredth part of the sun's distance. To attempt to ascertain the sun's distance, before they had found out that of the moon, was about as reasonable as it would be to require a man to raise a body of 10,000 tons, who had not strength to lift 500 pounds; yet so it was.

The ancient astronomers endeavoured to find out the distance of the sun by the earth's shadow in a lunar eclipse; also by the phases of the moon. Hipparchus, it is said, invented the former, and Aristarchus the latter: their methods, with some modifications, have

been adopted by the moderns; but as the distances made out thereby have been entirely vague and contradictory, another, for the sake of novelty, was proposed to the Royal Society, by that great calculator, Doctor Halley; namely, that of making observations on the transits of Venus, in the years 1761 and 1769. "At these times" (Encyclo. Brit.) "the greatest attention was given by astronomers, but it was found impossible to observe the exact times of immersion and emersion, with such accuracy as had been expected; so that the matter is not yet determined so exactly as could be wished." I would ask any rational man, what accuracy could be expected in the determination of an angle of $\frac{8}{3600}$ of a degree, or 8″, from any observations made upon the sun's luminous body? With equal regard to truth and reason they might assert, that, by taking two stations, a yard from each other, in a dark night, they could determine, mathematically, the distance of a lamp suspended in the air at the unknown distance of fifteen miles from the observers; for a base line of a yard would bear the same proportion to that, as the semidiameter of the earth to 100,000,000 of miles,—the present estimated distance of the sun.

Dr. Halley's celebrated dissertation on the method of finding the sun's parallax by the transit of Venus, contains false and delusive positions in the very first page of it. Alluding to Mr. Horrox's account of the transit observed by him, he asserts, that, "it has at length *been found*, that the semidiameter of Venus, *seen from the sun*, subtends no more than a *fourth part of a minute;* Mercury *ten seconds;* Saturn the same, and Jupiter *twenty seconds*." An assertion such as this, was quite worthy of the man who set up his own authority in opposition to Divine Revelation. How could he tell what would be

the appearance of those planets to a spectator placed in the sun? For, at that time his proposed method *had never been tried;* and he does not affirm, that he himself, or any of his brother mathematicians, had ever ascended to the sun to take from that station a survey of the universe! A foreigner, unacquainted with the Newtonian dogmas, might however have supposed, on hearing of the operations of gravity, that, by means of its marvellous occult power, Halley, or his friends, had been carried to the sun for that purpose, and, that the centrifugal force of repulsion had kindly sent him back again to communicate to his fellow mortals the important particulars he had seen; or that he had received the information from that contemporary theologian who professed to hold converse with the spirits of men who had inhabited the said planets as well as others among the fixed stars! Be all this as it may, Halley thought proper to adopt the same solar parallax as Eratosthenes did about 2000 years before him: and the observers of the transits, on their part, contrived to bring the result of their observations and calculations sufficiently near to the previously recorded opinion of Halley!

I do not in the least blame astronomers for being ignorant of the true magnitudes and distances of the sun, moon and stars. But, as learned men, they are certainly inexcusable for endeavouring to impose upon the world an account of distances and magnitudes which they must certainly have known, could not possibly be ascertained by any of the theories upon which they have pretended to ground their calculations. That such is the fact, is sufficiently evident from the subjoined statement, which contains the opinions of the most celebrated astronomers, of different ages and nations, concerning the sun's distance from the earth.

| | | |
|---|---|---|
| Hipparchus, - - - - - - - - | 1586 | semidiameters of the earth. |
| Posidonius, - - - - - - - - - | 13141 | |
| Ptolemy, - - - - - - - - - - | 1210 | |
| Albategnius, - - - - - - - - | 7936 | |
| Copernicus, - - - - - - - - | 942 | |
| Kepler, - - - - - - - - - - | 3438 | |
| Ricciolus, - - - - - - - - - | 7600 | |
| Newton, - - - - - - - - - - | 15000 | |
| Later Astronomers, - - - - | 21000 | |
| Present Astronomers, - - - | 25000 | |

The last mentioned, being the most marvellous, I believe is now generally adopted by the learned as the *true* distance.

The rule which philosophers have adopted from Kepler, for the determination of the distances of the other planets, appears to me to be as fanciful as the rest of that astrologer's notions concerning "the stars and planets being inhabitants of æther, which live and move in that element like butterflies in the air;" and that the "densities of the planets Saturn, Jupiter, Mars, Earth, Venus, and Mercury, may be compared to a diamond, a loadstone, iron, silver, lead, quicksilver, and the sun to gold: which," say the Newtonians "was a *happy* conjecture, though the time was not *then* come to *weigh* the celestial bodies and to estimate with *exactness* their different densities." One of Kepler's admirers tells us, that, "by calculations founded on a series of the most *accurate observations*, *(fanciful conceptions*, he ought to have said,) he discovered that the squares of the times, in which any two planets complete their revolutions in their orbits, are exactly proportionate to the cubes of their mean distances from the sun. Venus for example revolves round the sun in 224 days and the

earth in 365, and the mean distance of the earth from the sun is 95,000,000 of miles. Hence according to Kepler, as the square of 365 is to the square of 224, so is the cube of 95,000,000 of miles to a fourth number, which is the cube of Venus's mean distance from the sun; and if the cube root of that number be found, it will give about 68,000,000 of miles for her real distance. The moons of Jupiter and Saturn are found to follow the same law in revolving round their primaries."

Here, according to their usual practice, they take for granted things which have never been proved; namely, the motion of the earth and one of its reputed distances from the sun. The planet Venus, too, instead of 224 days, if we may believe the evidence of our eyes, takes up about 590 in revolving round the sun from one conjunction to the next of the same denomination: which fact ought to upset their imaginary analogy at once. No, no, say they, that appearance is owing to the combined motions of the earth and Venus. I repeat again, give us a proof of terrestrial motion.

Now with regard to the confirmation which the satellites of Jupiter are said to give of this celebrated Keplerian law; let us compare the observations of astronomers upon these bodies and see how they agree together. It was Galileo who first discovered them, as we are informed, by means of his telescope, and he observed their motions with great diligence. Their distances from Jupiter, are stated by him as follows, with which the testimonies of Simon Marius, Rheita and Vendelinus nearly coincide.

| | *1st.* | *2nd.* | *3rd.* | *4th.* | |
|---|---|---|---|---|---|
| Galileo, - - | 3 | 5 | 8 | 12 | } semidiameters of Jupiter. |
| Rheita, - - - | 3 | 4 | 6 | 10 | |
| Newtonians, | $5\frac{2}{3}$ | $9\frac{1}{5\,9}$ | $14\frac{5}{1\,3}$ | $25\frac{1}{1\,0}$ | |

It thus appears that the Newtonians state these distances nearly double of what the others estimated them. What can be the reason of this great difference? Is the centrifugal force driving them off; or does *theory* require the *observations* of former astronomers to be corrected? I do not find fault with them, because they differ so widely in their accounts; for the whole system of Jupiter and his satellites is comprehended in an angular space equal to the size of a small pea placed a yard from the eye, and of course a *trifling* mistake of 2 or 300,000 miles might easily be made! This would be excusable; but I believe it has frequently happened, that an attachment to theory and favourite systems, has induced men to misrepresent and depreciate the labours of their predecessors. Moreover, in their zeal to discover analogies they are sometimes strangely carried away by fancies. A number of them assert, that they think they have seen a moon belonging to, and near, the planet Venus, which others disbelieve and deny, probably because Mars, which is situated at twice the distance is destitute of that advantage!

Then with respect to the rotatory motion of these bodies, imagination seems to have supplied the defects of eye-sight and telescopes, as appears by the following statement.

| | Venus. | | | Mars. | | | Jupitér. | | | Saturn. | | |
|---|---|---|---|---|---|---|---|---|---|---|---|---|
| | *d.* | *h.* | *m.* | *d.* | *h.* | *m.* | *d.* | *h.* | *m.* | *d.* | *h.* | *m.* |
| Rheita, | 0 | 14 | 0 | 1 | 21 | 6 | 11 | 20 | 1 | 29 | 10 | 1 |
| Cassini, adopted by present Astronomers, | 0 | 23 | 0 | 1 | 0 | 40 | 0 | 9 | 56 | —— | | |
| Roman Astronomers, | —— | | | 0 | 13 | 0 | —— | | | —— | | |
| Bianchini, | 24 | 8 | 0 | —— | | | —— | | | —— | | |
| Herschell, | —— | | | —— | | | —— | | | 0 | 10 | 16 |

La Place says, that the rotation of Mercury on his axis is accomplished in $24^{h.}\ 5^{m.}\ 28^{s.}$ Bonnycastle says that it has never been discovered, because no spots appear on his disk. How then did La Place discover it?

By this it appears, that the accounts of these observers of the heavens, concerning the vertiginous motions of these supposed worlds, are as uncertain as the melting snows which they imagine they sometimes descry at the distance of 50,000,000 of miles about the poles of the planet Mars! But however these matters may be, it does not seem to me, a wise employment, to be searching the heavens for arguments to countenance the unproved doctrine of terrestrial motion. It would be as reasonable to attempt to persuade a man at rest, that he is in motion similar to one seen in the act of running, at the distance of a mile. Few, however, will give themselves the trouble attentively to consider these things, therefore the imposing name of philosophy often proves a passport for evident contradictions and gross absurdities, especially when the opinions and doctrines of an eminent genius are recommended by plausibility of manner combined with an elegant style of composition.

A book published by Dr. John Scott, in the year 1754, on *The Holy Scriptural Doctrine of the Divine Trinity in Essential Unity;* from pages 130 to 210, contains some very acute and excellent observations upon the "*Mathematical Principles of Natural Philosophy;* wherein," he says, "the divinely revealed Word of God set forth in the Holy Scriptures, which carries along with it not only the most clear and evident proof, both of its divine original, and of its truth, is set at nought, and contradicted, either inconsiderately, or designedly, by the author of that system, who had these Holy Scriptures in his possession." I would, with pleasure have introduced some extracts from this work; for he appears to have been a learned and an excellent man; but they would have increased the size of my own book too much, which is extended beyond the limit I had anticipated.

I therefore hasten to a conclusion of this part of my undertaking.

What was said by Diodorus Siculus, in his first book, concerning the instability of the opinions of the Greek philosophers, is equally applicable to the philosophers of Christendom who have imbibed their spirit and principles. "Though some few," says he, "give themselves up wholly to philosophy, yet they persist only for gain, continually innovating some things in the most considerable doctrines; and never follow those that went before them; whereas the Chaldeans preserve their learning within themselves by a continued tradition from father to son. But the Greeks aiming at gain, by *this profession*, erect *new sects*, and *contradicting each other* in the *most considerable theorems*, make their *disciples dubious*, and their minds as long as they live *are in suspense and doubt;* neither *can they firmly believe any thing:* for if a man examine the *chiefest sects of the philosophers*, he will find them *most different from one another* and *directly opposite* in the *principal assertions*."

If any excuse for instability were admissible, it might be urged in behalf of the Greeks and other nations, who had gradually fallen away from the simple and pure knowledge of God and his works, which had been preserved and handed down by the first fathers of mankind after the flood: but even after the loss of that knowledge, there remained sufficient evidences of the existence, omnipresence, power and goodness of the One God to have saved them from the idols of their own imaginations, had they attentively observed and honestly reflected upon his wonderful works. That true philosopher St. Paul, testified, and very justly too, that "the invisible things of him from the creation of the world are clearly seen; being understood by the things that are

made; even his eternal power and Godhead; so that *they are without excuse.*" If then the instability and ignorance of the Gentile nations, in a knowledge of the true God and his works, was inexcusable, what can be said for those who, while they have the Sun of Truth constantly shining before them, shut their eyes to its steady light, and prefer to follow the wandering sparks of their own imaginations?

But so it has been; so it is, and so it ever will be,—so long as men "forsake the fountain of living waters and continue to hew out to themselves false and useless vessels that can hold no water." I could easily fill a volume with an enumeration of the contradictory opinions of the ancient and modern philosophers. And I could as easily show, that, on almost every point upon which the moderns are constantly wrangling, the Greek philosophers vainly disputed more than two thousand years ago; but I have no wish to fatigue my readers with a recital of their endless dogmas; it would be taking up their time to no beneficial purpose.

Amongst the Greek philosophers, such as Protagoras, and others of the sophists, many raised themselves to affluence and distinction. People of rank and wealth placed their sons under their care, and paid them large sums for their education. The sophists taught them, in a plausible and superficial manner, such artifices as enabled them, when they came to occupy public situations in the commonwealth, to tickle the ears of the people, and to catch popularity, while they were deficient in those solid acquirements which should have rendered them the pillars and the ornaments of their country. Some honest men, however, occasionally appeared amongst them, and laboured to recal them to the simplicity of nature, and to such a knowledge of the

true God, as could be attained by temperance and a contemplation of His works. Socrates, for example, was not such a philosopher as Diodorus described; he was no hireling: he diligently pursued the light of nature: he marked the operations of God in the stupendous theatre of the universe; from which he deduced certain evidence of His existence and wise government; which he demonstrated by the most luminous and conclusive arguments. Offices of public trust, it would appear, were at that time filled by the disciples of the sophists. The steady light of Socrates beamed upon their conduct and actions, and they would not bear its influence: hence his melancholy fate; which was soon followed by the destruction of the liberties of Greece.

I offer a tribute to the memory of that excellent man.

Nature to Socrates an uncouth form assign'd—
An index of a soul to vicious ways inclin'd;
'Till wisdom's laws his wayward will subdu'd,
And her sweet influence all his pow'rs imbu'd:
The lion then transform'd into the dove,
And all his mind attun'd to heav'nly love;
Virtue's fair form he woo'd with ardent flame,
As firm he bent his course to deathless fame.
And when at length possess'd of all her charms,
He shone in justice, wisdom, deeds of arms;—
When nought in his great views could find a place,
But gen'rous friendship for the human race:
When sophists' wiles successfully he pos'd,
And vice and faction dauntlessly expos'd,
His steady light laid bare corruption's course,
And error vanquish'd with resistless force:—
'Twas then his enemies, in dark array,
Conspir'd to move him from his god-like way;
The poison'd phial, by demoniac spite,

Was pour'd upon this orb of moral light!
Ev'n then sublime he mov'd, in truth array'd,
Nor virtue's cause, in aught, he once betray'd;
To life's last verge majestic he declin'd,
And glorious left his parting beams behind!
The sage remov'd, and justice at a stand,
A moral gloom pervaded all the land;
'Till radiant truth on his remorseless foes
Conviction flash'd, and Greece indignant rose,—
Dealt retribution on each guilty head,
And mourn'd the man who youth to virtue led;
Statues and monuments then rose around,
And his great name immortal glory crown'd!

In future, I trust, this interesting people will derive wisdom, not only from a retrospection of their ancient history, but likewise from the adoption of a better dispensation of knowledge than is to be found amongst the changeable doctrines of their ancient philosophers. I hope they will adopt the Divine basis—which will be the certain highway to national importance, and to individual prosperity.

But what is it that our modern philosophers want? What are they searching after? Leucippus, Democritus, and Epicurus, amongst the ancients, and Gassendus, and his followers amongst the moderns, have taught that there are no beings, except atoms; which, they have acknowledged, are not to be detected by the senses, and of course are imaginary beings. Their fancies having, however, set them afloat throughout the universe, they will have them disposed of in the eternal formation of worlds—bodies animate and inanimate. Buffon will have *his* worlds formed from masses of matter, struck off from the surface of the sun by comets in rapid motion, and put into order by gravity, forgetting *that* authority

which has taught us that the earth existed before the sun was formed. Newton's imagination will have *his* worlds formed out of the sediments of solar light, by gravity and electrical and subtile spirits; and La Place, differing but little from him, forms and arranges *his* universe out of dense solar atmospheres. These profound geometricians, likewise, give the sun the priority in creation, and therefore contradict the scripture. Behold! these *creators* not only contradict the scripture, but they contradict each other; and instead of "all being light," as their poetical flatterers assure us, they only plunge us into doubt and darkness: and, therefore, their opposite doctrines can no more form one consistent rational believer, than their atoms, corpuscles, solar fragments, sediments, or atmospheres, can form a world. Besides, the universe was perfectly formed, and put in motion, before their plans or materials were even thought of; therefore their mighty labours are all in vain; they have neither altered the universe, nor added to it, a single particle; for, the description that was given of it more than five thousand years ago, perfectly agrees with the magnificent spectacle which it holds up to our admiring view at this day.

So far, then, from these philosophers being the privy councillors of nature, their constant disputes and contradictory doctrines manifestly prove, that they have not even had a single peep under the veil that covers her secret operations. The earth is firmly at rest; and it will retain its sedentary nature, and true spherical form, in spite of their projectile and centrifugal forces; nor will the absence of those chimeras, for a single moment, stop the stars in their perpetual courses. The sun will continue to dispense its light and heat without the liberal supplies of the fuel of their imaginary comets;

velocities of the bodies of which he is master, of all the experiments which come within his view, and especially under his hand; in a word, let him apply experiments to the necessaries of life, and he will have an unerring philosophy, replete with great advantages. But to undertake to determine the cause which governs the motion of the universe, and to penetrate into the universal structure, and the particular parts of which it it is composed, is to forfeit the honor of improving his patrimony in order to run after shadows. It is neglecting treasures which are open to us, and obstinately persisting to knock at a door which has been shut against us these six thousand years."

The swelling period, and the well-trimm'd line,
Awhile, like gaudy froth, appear to shine,
Like that distort the passing forms display'd,
As pride inspires, and folly takes the lead.
Thus vain philosophy, from age to age,
In fruitless toil employs the fancy'd sage,
Whose fine-spun notions broach'd, pretence affords
For learn'd contention, and a strife of words:
Like nimble gladiators, each displays
His dext'rous skill to gain the crown of bays,
And fix a lasting empire o'er the mind
Of empty postulates—dogmatic wind,—
Those flimsy webs, which roving fancy forms,
Doom'd to be rent by controversial storms,—
Those splendid bubbles, which the learn'd display,
Rais'd by a breath, explode and pass away.
Lo, he who form'd the universal frame,
His works describ'd, and gave each part its name;
Then left the record, for all future time,
Man to instruct in ev'ry earthly clime,—
How all the parts of the stupendous whole,
By voice divine, appear'd from pole to pole;

How each in orderly succession rose,—
All things in earth; each heav'nly light that glows.
In man, his image, wisely He combin'd
Organs of sense with a reflecting mind;
That he might see and contemplate each hour
On all the wonders of Almighty pow'r!
Those shining orbs above, of heav'nly mould,
Which have from dawn of time incessant roll'd,
And shown to ev'ry age, in ev'ry clime,
Revolving seasons and progressive time,—
Faithful proclaim, as round the world they shine,
ORDER PROCEEDS ALONE FROM PLANS DIVINE!
How foolish, then, to slight fair nature's ways,
And choose the intricate and darksome maze,
To which weak sophistry, with artful guise,
Unceasing labours to seduce the wise,—
With abstract figments tries to lure the mind,
To doubt each sense and cast the truth behind;—
That sacred truth, in which transcendent shine
Th' immortal precepts of the laws divine;—
Those laws, benignly sent to lead the soul
And place the passions under wise control,
If once adopted, man would sweetly prove,
ORDER ON EARTH AS IN THE HEAV'N ABOVE!

## TO TRUTH.

O Source of science, pure exhaustless spring!
From thy clear fountain who shall knowledge bring,
And, (freed from schoolmen's arts—true wisdom's blight,)
Reveal the fruits of thy transcendent light?

Not proud ambition's towering spires,
Nor envy's snaky crest reflect thy fires;
Round these thy beams no sacred lustre shed,
Nor, radiant, crown th' artful sophist's head.

Nor his, whose lamp of reason wastes its oil
For lucre's dirt, or flatt'ry's baneful smile;
Such may profess thy beauteous courts to tread,
But such ne'er can thy blissful empire spread.

Blooming, sublime, above the storms of life,
Far from base passions and ignoble strife;
Thy spotless orb, thy pure unfading blaze,
Takes no false mediums to transmit its rays.

Not venal they who climb the steepy mount,
And, thirsty, drink at thy clear hallow'd fount;
Unsway'd by names, they view with free delight
Thy simple charms that shine serenely bright.

Thy willing sons, warm'd with thy gen'rous flame,
And scorning sordid paths to empty fame,
Unaw'd by sceptic sneers, or bigots' rage,
Shall found thy realm and hail thy happy age.

Resistless truth! O chase the shades away,
In splendour rise and claim thy promis'd day;
Each art expose which thy fair face deforms,
And, potent, sweep off error's troubled storms.

Lo, now the dawn appears, the darkness flies,
Primeval science greets our longing eyes;
Before th' orient beams its op'ning flow'rs
Expand as fed by truth's eternal show'rs!

*To the general remarks which I have made from page 86 to 96, on the TIDES; I have thought it proper to add what follows on the*

## TIDES IN THE PORT OF LIVERPOOL.

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THE late Mr. William Hutchinson, whom I have before mentioned, while he was harbour master of this port, made a regular series of observations upon the tides, winds, &c. from day to day, during a period of about 29 years. The manuscript, containing his observations for 24 years, is now in the Lyceum Library in this town. It is a valuable record, and I think it ought to be published for the improvement of this branch of knowledge. Mr. Hutchinson was a scientific and worthy man. Instead of employing his time upon vain theories, he applied his talents in various ways to the advantage of his country, in the improvement of navigation; he was the author of a *Treatise on Practical Seamanship*. The Tide Tables now published in Liverpool are, I believe, grounded upon his observations; and from a series which I have now in my possession, I have extracted the heights of the tides at the Full and Change of the Moon for ten years; which comprehends a complete period of the revolution of what is termed the Moon's Apogee. I have collated these particulars with a copy of Mr. Hutchinson's actual observations; and I have reason to believe that the heights are as correctly deduced as the nature of the subject will admit. Upon adding up the columns of the heights at the New and Full Moons respectively; and of the regular alternate excess of the one above the other, it appears that there is no sensible difference between them; no indication whatever of the operation of attraction or gravity; and therefore it may fairly be concluded, that no such force as solar or lunar attraction has any real existence. I have formed them into a table comprehending the years 1803 to 1812, inclusively.

When Sir Isaac Newton laid down his system of universal gravitation, and in particular, his application of it to explain the flowing and ebbing of the sea, he should have taken the precaution of acquainting himself with all the actual phenomena of the tides during at least a revolution of what is termed the moon's apogee; his ingenuity might then have enabled him to form his ratios, so as to fit all the phenomena; but that he neglected to do, and therefore his theory is perfectly useless. In the Encyclopædia Britannica are the following candid remarks.

"The reader will undoubtedly be making some remarks in his own mind of the deductions from this theory with the *actual state of things*. He will find some considerable resemblances; but he

will also find such great differences, as will make him very doubtful of its justness. In very few places does the high water happen within three quarters of an hour of the moon's southing, as the theory leads him to expect; and in no place whatever does the (*highest*) spring tide fall on the day of new and full moon, nor the (*lowest*) neap tide on the day of her quadrature. These always happen two or three days later. By comparing the differences of high water, and the moon's southing, in different places, *he will hardly find any connecting principle.*"

That there is a certain *coincidence* between the lunar motions and the motions of the currents in the ocean cannot be denied; but that there are any appearances in the ocean to prove the existence of either lunar or solar *attraction* I positively deny. La Place, with six years' observations before him, which had been made in the ports of France, might have given a plain and intelligible account of the tides; but he was so deeply involved in the sophistry of the system, that he could not well extricate himself from it. He indeed excelled in the art of sophistry;—and of throwing an air of awful profundity over every thing upon which he treated. By his constant professions of submitting every thing to the most rigorous analysis, and by a dexterous employment of his technicalities, he, like the rest of his coadjutors, succeeded to a miracle in fixing the faith of his readers; most of whom have no spare time, nor ability in that way; nor will they take the trouble to examine his assumptions.

When he found, as he appears to have done, on an examination of the observations which had been made in the French ports, that the tides at the full and change of the moon were of the same heights, he ought to have concluded that there was no such thing as attraction. Newton, as I have before said, stated the moon's attraction in raising the tides to be about nine feet, and the sun's about two feet. Well then; suppose the two bodies, when in conjunction, to be operating upon the ocean, with these *forces combined*, ought we not in all cases to have higher tides when these luminaries are *so posited*, than when they are in *opposition*; that is to say, when the force of one is *counteracting*, and therefore *deducting* from, the force of the other? Gravity, we are told, uniformly acts in straight lines, and with equal forces at equal distances; and therefore the tides ought to be four feet higher at the new than they are at the full moon. But these mathematical sophists, with most astonishing address, sometimes employ the imaginary force of gravity to attract, and at other times to repel, just as it may happen to suit their purpose; they make it out that, it gives us a high tide soon after the moon passes the meridian *at noon*, and also another, soon after it passes the *opposite* meridian at *midnight*.

| Years and Months. | Days of F.M. | Heights of Tides. | | Years and Months. | Days of N.M | Heights of Tides. | | Difference in the Heights. Full exceeds New. | | New exceeds Full. | |
|---|---|---|---|---|---|---|---|---|---|---|---|
| 1803. | | F. | I. | 1803. | | F. | I. | F. | I. | F. | I. |
| January .... | 7 | 16 | 6 | January .... | 23 | 19 | 11 | | | 3 | 5 |
| February ... | 6 | 17 | - | February ... | 21 | 21 | 9 | | | 4 | 9 |
| March ..... | 8 | 17 | 7 | March ..... | 23 | 21 | 11 | | | 4 | 4 |
| April..... | 7 | 17 | 6 | April..... | 21 | 21 | 4 | | | 3 | 10 |
| May ..... | 6 | 16 | 8 | May ..... | 20 | 18 | 7 | | | 1 | 11 |
| June..... | 5 | 15 | 10 | June..... | 19 | 16 | 9 | | | - | 11 |
| July ..... | 4 | 17 | 5 | July ..... | 18 | 16 | 8 | - | 9 | | |
| August..... | 3 | 19 | 8 | August..... | 17 | 17 | 1 | 2 | 7 | | |
| September .. | 1 | 21 | 2 | September .. | 15 | 16 | 11 | 4 | 3 | | |
| September .. | 30 | 21 | 2 | October .... | 15 | 16 | 7 | 4 | 7 | | |
| October .... | 30 | 20 | 5 | November .. | 14 | 16 | 5 | 4 | - | | |
| November .. | 28 | 19 | - | December .. | 14 | 16 | 4 | 2 | 8 | | |
| December .. | 28 | 18 | 2 | January .... | 12 | 18 | 6 | | | - | 4 |
| 1804. | | | | 1804. | | | | | | | |
| January .... | 26 | 18 | 5 | February ... | 11 | 20 | 3 | | | 1 | 10 |
| February ... | 25 | 18 | 1 | March..... | 11 | 21 | 3 | | | 3 | 2 |
| March ..... | 26 | 17 | 8 | April..... | 10 | 21 | 7 | | | 3 | 11 |
| April..... | 24 | 16 | 11 | May ..... | 9 | 19 | 9 | | | 2 | 10 |
| May ..... | 24 | 15 | 3 | June..... | 7 | 18 | 6 | | | 3 | 3 |
| June..... | 23 | 15 | 9 | July ..... | 7 | 18 | 2 | | | 2 | 5 |
| July ..... | 22 | 17 | 7 | August..... | 5 | 18 | 3 | | | - | 8 |
| August..... | 21 | 19 | 1 | September .. | 4 | 18 | 5 | - | 8 | | |
| September .. | 19 | 20 | 3 | October .... | 3 | 17 | 5 | 2 | 10 | | |
| October .... | 19 | 20 | 2 | November .. | 2 | 16 | 1 | 4 | 1 | | |
| November .. | 17 | 20 | 2 | December .. | 2 | 15 | 11 | 4 | 3 | | |
| December .. | 16 | 19 | 4 | January .... | 1 | 16 | 7 | 2 | 9 | | |
| 1805. | | | | 1805. | | | | | | | |
| January .... | 15 | 19 | 7 | January .... | 30 | 18 | 3 | 1 | 4 | | |
| February ... | 13 | 20 | 1 | March ..... | 1 | 19 | 5 | - | 8 | | |
| March ..... | 15 | 19 | 5 | March ..... | 30 | 20 | 2 | | | - | 9 |
| April..... | 13 | 18 | 2 | April..... | 29 | 19 | 11 | | | 1 | 9 |
| May ..... | 13 | 16 | 1 | May ..... | 28 | 18 | 10 | | | 2 | 9 |
| June..... | 12 | 15 | 2 | June..... | 26 | 19 | 9 | | | 4 | 7 |
| July ..... | 11 | 15 | 9 | July ..... | 26 | 19 | 9 | | | 4 | 7 |
| August..... | 10 | 17 | 2 | August..... | 24 | 19 | 10 | | | 2 | 8 |
| September .. | 9 | 18 | 1 | September .. | 23 | 19 | 4 | | | 1 | 3 |
| October .... | 8 | 19 | - | October .... | 22 | 18 | 1 | - | 11 | | |
| November .. | 7 | 18 | 9 | November .. | 21 | 16 | 9 | 2 | - | | |
| December .. | 6 | 19 | 8 | December .. | 20 | 16 | 1 | 3 | 7 | | |

| Years and Months. | Days of F.M. | Heights of Tides. | | Years and Months. | Days of N. M | Heights of Tides. | | Difference in the Heights. Full, exceeds New | | New, exceeds Full | |
|---|---|---|---|---|---|---|---|---|---|---|---|
| 1806. | | F. | I. | 1806. | | F. | I. | F. | I. | F. | I. |
| January .... | 4 | 20 | 2 | January .... | 19 | 16 | 11 | 3 | 11 | | |
| February ... | 3 | 21 | 3 | February ... | 18 | 17 | 7 | 3 | 8 | | |
| March ..... | 4 | 21 | 3 | March ..... | 20 | 18 | 2 | 3 | 1 | | |
| April..... | 3 | 20 | 5 | April..... | 18 | 18 | 7 | 1 | 10 | | |
| May ..... | 2 | 18 | 5 | May ..... | 18 | 18 | - | - | 5 | | |
| June..... | 1 | 16 | 3 | June..... | 16 | 18 | 5 | | | 2 | 2 |
| June..... | 30 | 16 | 5 | July ..... | 15 | 20 | 8 | | | 4 | 3 |
| July ..... | 30 | 16 | 5 | August..... | 14 | 20 | 10 | | | 4 | 5 |
| August..... | 29 | 16 | 10 | September .. | 12 | 21 | 1 | | | 4 | 3 |
| September .. | 27 | 17 | 2 | October .... | 11 | 20 | 2 | | | 3 | - |
| October .... | 27 | 17 | 3 | November .. | 10 | 19 | 1 | | | 1 | 10 |
| November .. | 26 | 18 | 2 | December .. | 10 | 17 | 3 | - | 11 | | |
| December .. | 25 | 19 | 5 | January .... | 8 | 16 | 7 | 2 | 10 | | |
| 1807. | | | | 1807. | | | | | | | |
| January .... | 24 | 21 | 2 | February ... | 7 | 17 | 4 | 3 | 10 | | |
| February ... | 22 | 21 | 9 | March ..... | 9 | 17 | 7 | 4 | 2 | | |
| March ..... | 23 | 21 | 10 | April..... | 8 | 17 | 4 | 4 | 6 | | |
| April..... | 22 | 20 | 6 | May ..... | 7 | 17 | 3 | 3 | 3 | | |
| May ..... | 21 | 18 | 4 | June..... | 6 | 17 | 3 | 1 | 1 | | |
| June..... | 20 | 17 | - | July ..... | 5 | 18 | 7 | | | 1 | 7 |
| July ..... | 19 | 16 | 6 | August..... | 3 | 20 | 1 | | | 3 | 4 |
| August..... | 18 | 16 | 8 | September .. | 2 | 21 | 2 | | | 4 | 6 |
| September .. | 16 | 16 | 10 | October .... | 1 | 21 | 1 | | | 4 | 3 |
| October .... | 16 | 16 | 6 | October .... | 31 | 20 | 5 | | | 3 | 11 |
| November .. | 15 | 17 | - | November .. | 29 | 19 | 6 | | | 2 | 6 |
| December .. | 15 | 17 | 8 | December .. | 29 | 18 | 5 | | | - | 9 |
| 1808. | | | | 1808. | | | | | | | |
| January .... | 13 | 19 | 5 | January .... | 27 | 18 | 1 | 1 | 4 | | |
| February ... | 12 | 21 | - | February ... | 26 | 17 | 6 | 3 | 6 | | |
| March ..... | 12 | 21 | 11 | March ..... | 27 | 17 | 5 | 4 | 6 | | |
| April..... | 10 | 21 | 7 | April..... | 25 | 17 | - | 4 | 7 | | |
| May ..... | 10 | 20 | 1 | May ..... | 25 | 16 | - | 4 | 1 | | |
| June..... | 8 | 18 | 11 | June..... | 24 | 16 | 9 | 2 | 2 | | |
| July ..... | 7 | 18 | 5 | July ..... | 23 | 18 | 7 | | | - | 2 |
| August..... | 6 | 18 | 2 | August..... | 21 | 19 | 9 | | | 1 | 7 |
| September .. | 4 | 17 | 5 | September .. | 20 | 20 | 6 | | | 3 | 1 |
| October .... | 4 | 16 | 9 | October .... | 19 | 20 | 9 | | | 4 | - |
| November .. | 3 | 16 | 4 | November .. | 18 | 20 | 9 | | | 4 | 5 |
| December .. | 3 | 16 | 7 | December .. | 17 | 20 | 1 | | | 3 | 6 |

| Years and Months. | Days of F.M. | Heights of Tides. | | Years and Months. | Days of N.M | Heights of Tides. | | Difference of the Heights. Full exceeds New. | | New exceeds Full. | |
|---|---|---|---|---|---|---|---|---|---|---|---|
| 1809. | | F. | I. | 1809. | | F. | I. | F. | I. | F. | I. |
| January .... | 1 | 17 | 6 | January .... | 16 | 19 | 9 | | | 2 | 3 |
| January .... | 31 | 18 | 11 | February ... | 14 | 19 | 2 | | | - | 3 |
| March ..... | 2 | 20 | 3 | March ..... | 16 | 18 | 7 | 1 | 8 | | |
| March ..... | 31 | 21 | 1 | April..... | 14 | 17 | 9 | 3 | 4 | | |
| April..... | 30 | 20 | 11 | May ..... | 13 | 16 | 1 | 4 | 10 | | |
| May ..... | 29 | 19 | 10 | June..... | 15 | 15 | 10 | 4 | - | | |
| June..... | 27 | 19 | 10 | July ..... | 15 | 16 | 8 | 3 | 2 | | |
| July ..... | 26 | 19 | 7 | August..... | 15 | 17 | 10 | 1 | 9 | | |
| August..... | 25 | 19 | 3 | September .. | 13 | 18 | 8 | - | 7 | | |
| September .. | 23 | 18 | 7 | October .... | 9 | 19 | 8 | | | 1 | 1 |
| October .... | 23 | 17 | 8 | November .. | 7 | 20 | 1 | | | 2 | 5 |
| November .. | 22 | 16 | 10 | December .. | 7 | 20 | 7 | | | 3 | 9 |
| December .. | 21 | 16 | 7 | January .... | 5 | 20 | 10 | | | 4 | 3 |
| 1810. | | | | 1810. | | | | | | | |
| January .... | 20 | 17 | 1 | February ... | 4 | 20 | 10 | | | 3 | 9 |
| February ... | 19 | 18 | 2 | March ..... | 5 | 20 | 7 | | | 2 | 5 |
| March ..... | 21 | 19 | 4 | April..... | 4 | 19 | 11 | | | - | 7 |
| April..... | 19 | 19 | 11 | May ..... | 3 | 19 | 2 | - | 9 | | |
| May ..... | 19 | 19 | 5 | June..... | 2 | 16 | 8 | 2 | 9 | | |
| June..... | 17 | 19 | 11 | July ..... | 1 | 16 | 1 | 3 | 10 | | |
| July ..... | 16 | 20 | 3 | July ..... | 31 | 16 | 5 | 3 | 10 | | |
| August..... | 14 | 21 | - | August..... | 30 | 17 | 3 | 3 | 9 | | |
| September .. | 13 | 20 | 7 | September .. | 28 | 17 | 11 | 2 | 8 | | |
| October .... | 12 | 19 | 8 | October .... | 28 | 18 | 5 | 1 | 3 | | |
| November .. | 11 | 18 | 11 | November .. | 26 | 19 | 9 | | | - | 10 |
| December .. | 10 | 17 | 7 | December .. | 26 | 20 | 4 | | | 2 | 9 |
| 1811. | | | | 1811. | | | | | | | |
| January .... | 9 | 16 | 9 | January .... | 24 | 20 | 11 | | | 4 | 2 |
| February ... | 8 | 17 | 3 | February ... | 23 | 21 | 9 | | | 4 | 6 |
| March ..... | 10 | 17 | 7 | March ..... | 24 | 21 | 3 | | | 3 | 8 |
| April..... | 8 | 18 | 1 | April..... | 23 | 20 | 5 | | | 2 | 4 |
| May ..... | 8 | 18 | 3 | May ..... | 22 | 18 | 5 | | | - | 2 |
| June..... | 6 | 18 | 3 | June..... | 20 | 16 | 11 | 1 | 4 | | |
| July ..... | 6 | 19 | 3 | July ..... | 20 | 16 | 3 | 3 | - | | |
| August..... | 4 | 20 | 6 | August..... | 19 | 16 | 6 | 4 | - | | |
| September .. | 2 | 21 | 1 | September .. | 17 | 16 | 10 | 4 | 3 | | |
| October .... | 2 | 21 | 2 | October .... | 16 | 16 | 9 | 4 | 5 | | |
| October .... | 31 | 20 | 2 | November .. | 16 | 18 | - | 2 | 2 | | |
| November .. | 30 | 19 | 5 | December .. | 15 | 18 | 8 | - | 9 | | |
| December .. | 29 | 18 | 2 | January .... | 14 | 20 | - | | | 1 | 10 |

| Years and Months. | Days of F.M. | Heights of Tides. | Years and Months. | Days of N.M | Heights of Tides. | Difference of the Heights. Full exceeds New. | Difference of the Heights. New exceeds Full. |
|---|---|---|---|---|---|---|---|
| 1812. | | F. I. | 1812. | | F. I. | F. I. | F. I. |
| January .... | 28 | 17 5 | February ... | 12 | 21 6 | | 4 1 |
| February ... | 27 | 17 5 | March ..... | 13 | 21 11 | | 4 6 |
| March ..... | 28 | 17 7 | April..... | 11 | 21 10 | | 4 3 |
| April..... | 26 | 17 - | May ..... | 10 | 20 5 | | 2 7 |
| May ..... | 26 | 16 9 | June..... | 9 | 18 8 | | 1 11 |
| June..... | 24 | 17 4 | July ..... | 8 | 17 6 | | - 2 |
| July ..... | 24 | 18 9 | August..... | 7 | 17 1 | 1 8 | |
| August..... | 22 | 20 1 | September .. | 5 | 16 9 | 3 4 | |
| September .. | 20 | 21 2 | October .... | 4 | 16 10 | 4 4 | |
| October .... | 20 | 20 1 | November .. | 4 | 16 7 | 3 6 | |
| November .. | 18 | 21 2 | December .. | 4 | 17 1 | 4 1 | |
| December .. | 18 | 19 9 | January .... | 2 | 17 9 | 2 - | |

In the above table, the *highest* tides are inserted; the greatest rise takes place generally two or three days after the full and change of the moon.

The column which contains the heights at the full moon, adds up 2310 feet, 9 inches: and the column which contains the heights at the new moon, adds up 2311 feet, which sums, respectively, divided by 124, the number of each, give 18 feet, 8 inches, nearly, for the mean of each.

The first column of the *differences*, adds up 172 feet, 6 inches; and the second, 172 feet, 5 inches; which, divided by 62, give about 2 feet, 9 inches for the mean, by which the tides at the full and change alternately exceed each other.

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THE END OF THE FIRST BOOK.

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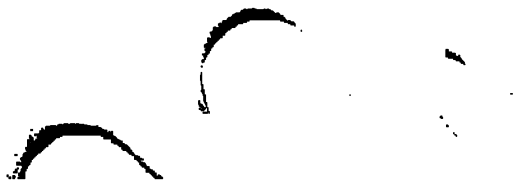

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